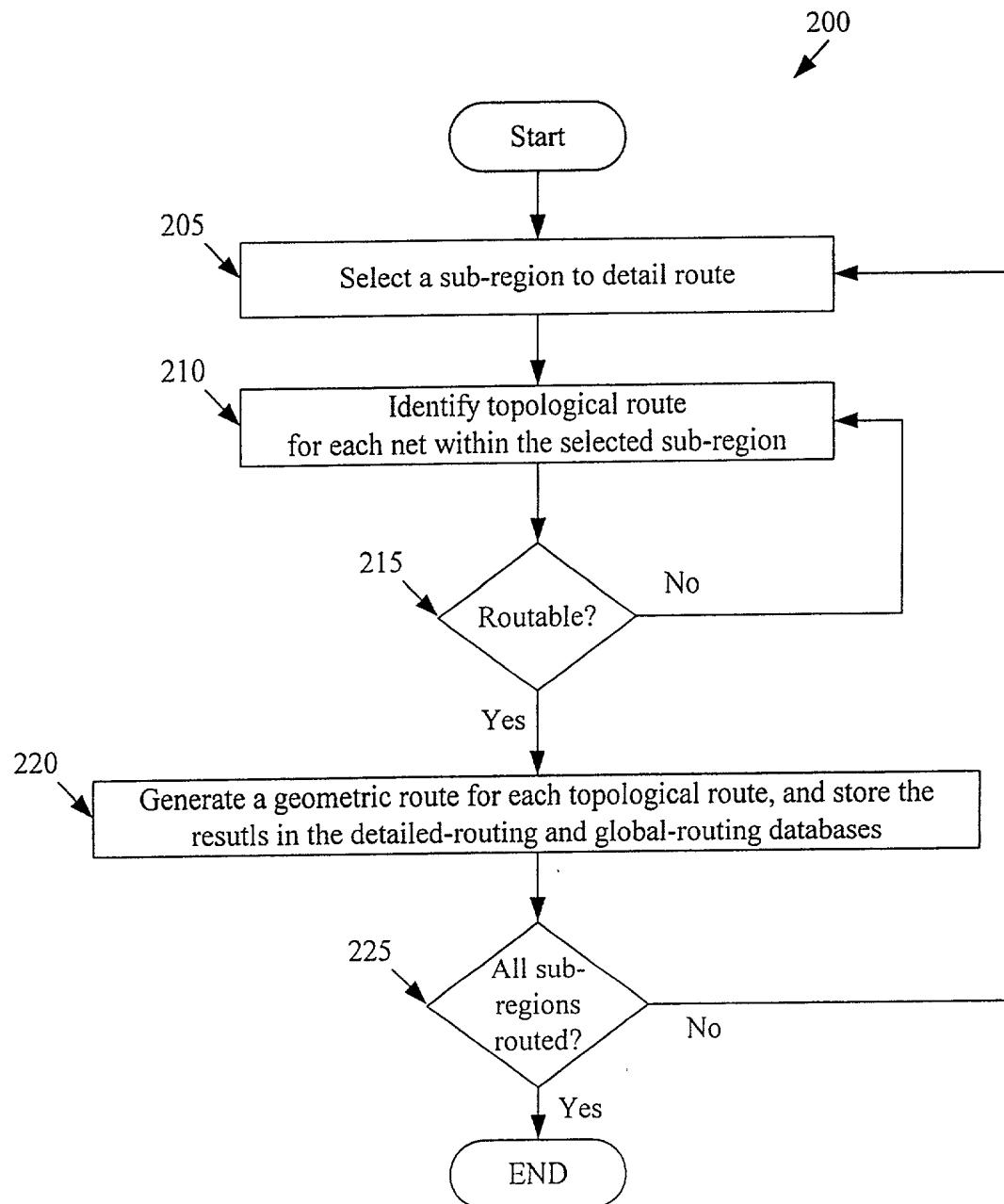
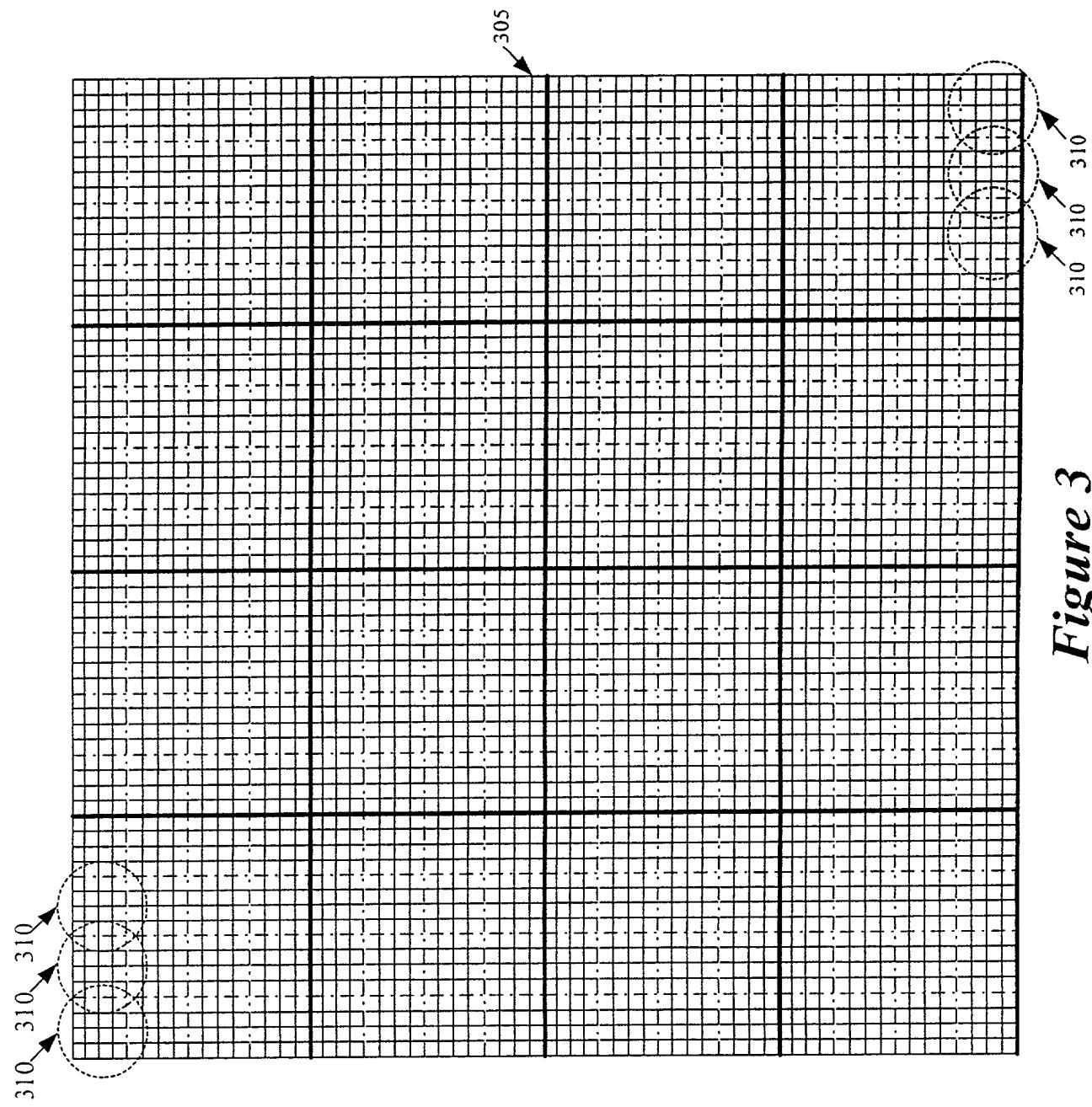


*Figure 1*

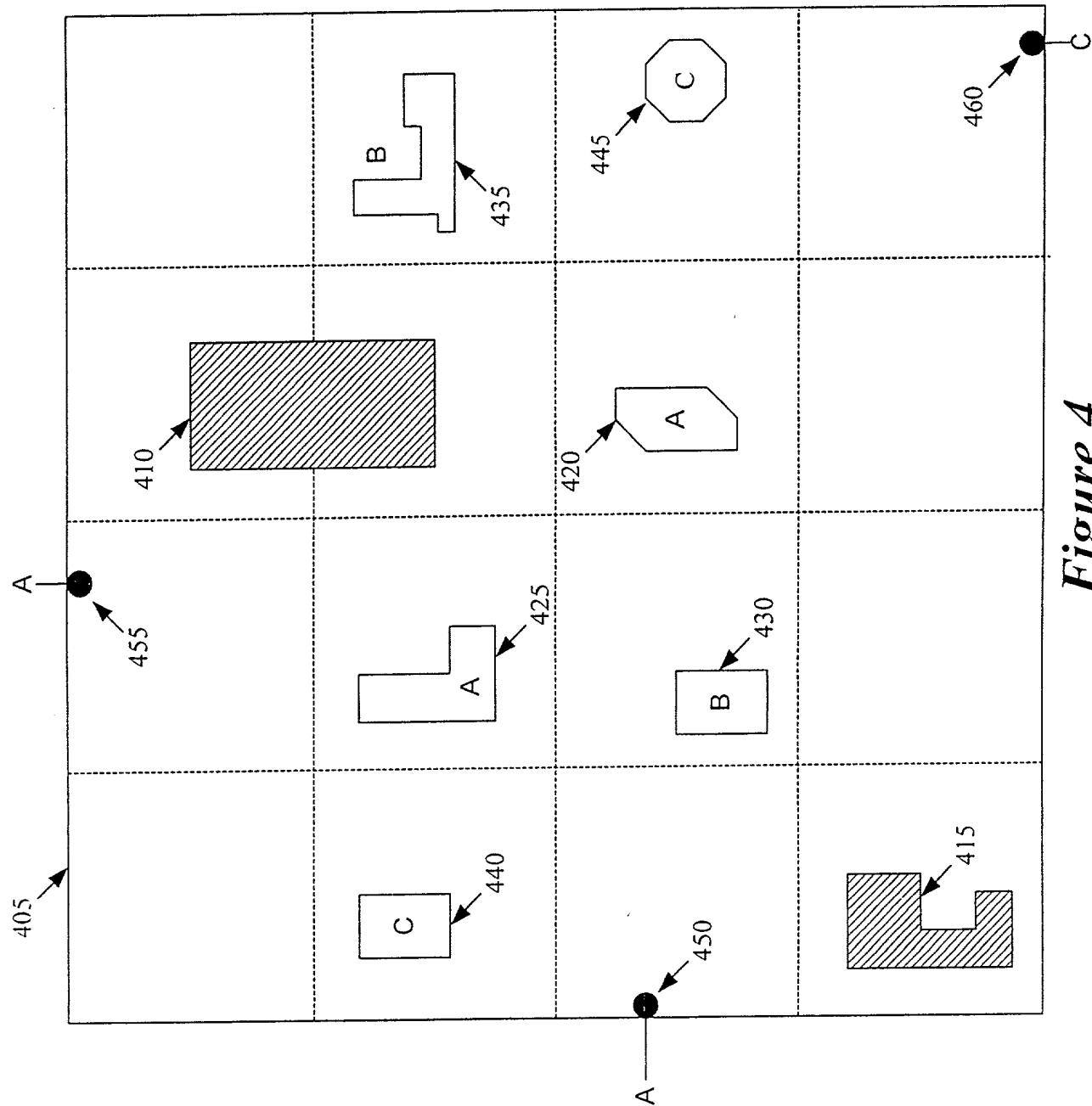


*Figure 2*

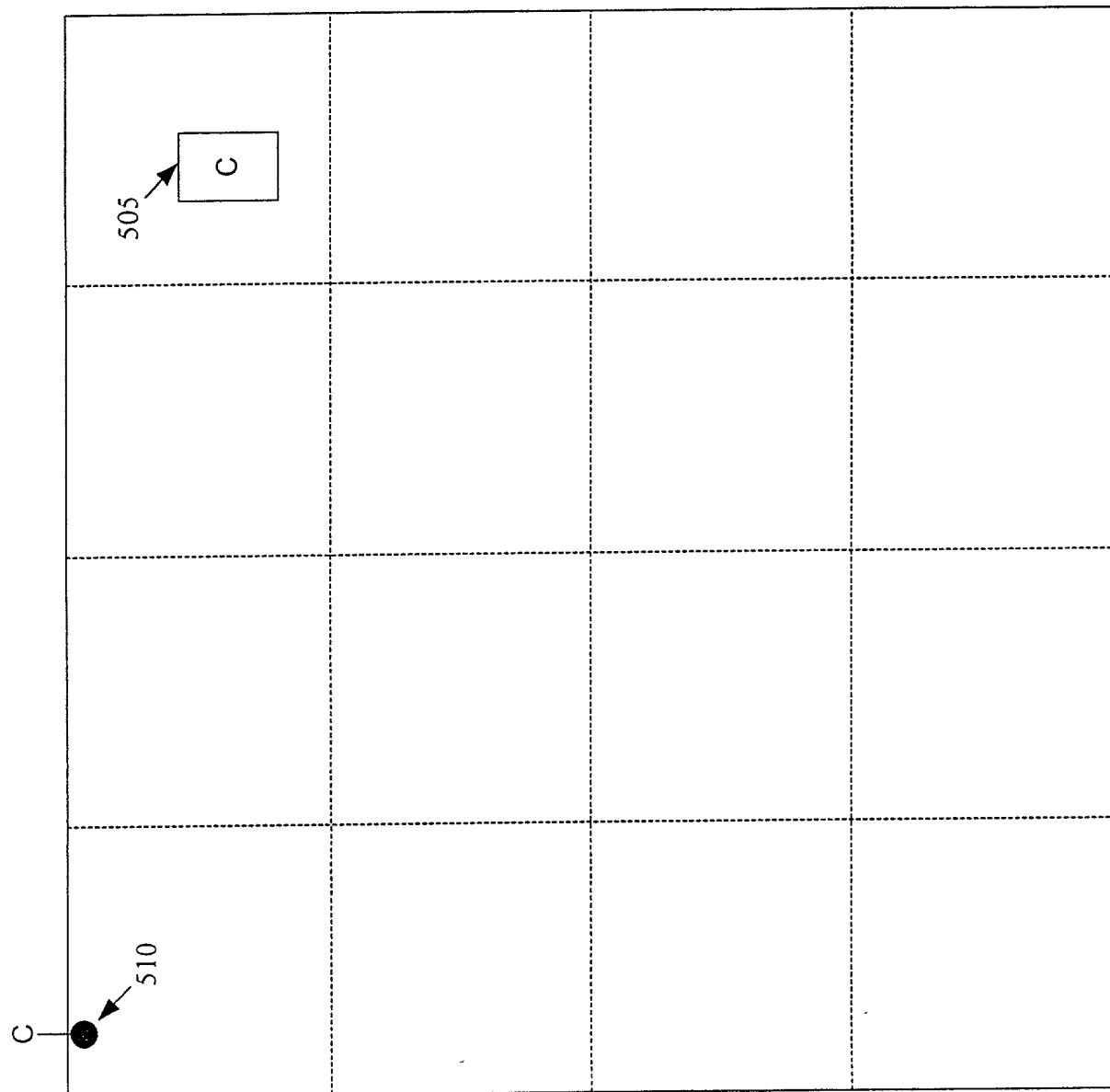


*Figure 3*

Figure 4



*Figure 5*



*Figure 6*

- List of Geometries
  - Each Geometry including a sequence of points & layer assignment
- Bounding box of the region
- Array of layer properties
  - Minimum wire size
  - Minimum spacing
  - Via sizes
  - Cost/Unit
- Netlist specifying a number of nets
  - Each net specifying a set of pins
    - Each pin specifying a set of ports
      - Each port specifying a set of geometries

*Figure 7*

- List of Geometries
  - Each Geometry including a sequence of points & layer assignment
- Bounding box of the region
- Array of layer properties
  - Minimum wire size
  - Minimum spacing
  - Via sizes
  - Cost/Unit
- Netlist specifying a number of nets
  - Each net specifying a set of pins
    - Each pin specifying a set of ports
      - Each port specifying a set of geometries
- For each layer, a graph specifying
  - Nodes
  - Edges
  - Faces

Face
<ul style="list-style-type: none"> <li>-Reference to 3 edges</li> <li>-Reference to 3 nodes</li> <li>-Up to two references for up to two face item</li> </ul>

800

Edge
<ul style="list-style-type: none"> <li>-Two references for up to two faces of the edge</li> <li>-Capacity</li> <li>-Flow</li> <li>-Constrained</li> <li>-Linked list of items on the edge starting with one of the edge's nodes and ending with its other node</li> </ul>

900

*Figure 8*

*Figure 9*

Node
-Net Identifier
-One or more planar-path references to adjacent topological items in the same planar path
-A pair of via-path references to up and down topological via items
1000
-A references to list of edges connected to the node
-For each edge, an edge reference to the next or previous topological item on the edge
-A reference to the geometry of the node
-Vertex number identifying the vertex of the geometry
-Location of the node

**Figure 10**

Edge Item
-Reference to its edge
-Net Identifier
-A pair of planar-path references to adjacent topological items in the same planar path
1100
-A pair of edge references to the next and previous topological item on the edge

**Figure 11**

Face Item
-Reference to its face
-Net Identifier
-Up to 3 planar-path references for adjacent topological items in the same planar path
1200
-A pair of via-path references for up and down topological via items
-Bounding polygon that defines legal face item locations
-Constraining Points and Distances

**Figure 12**

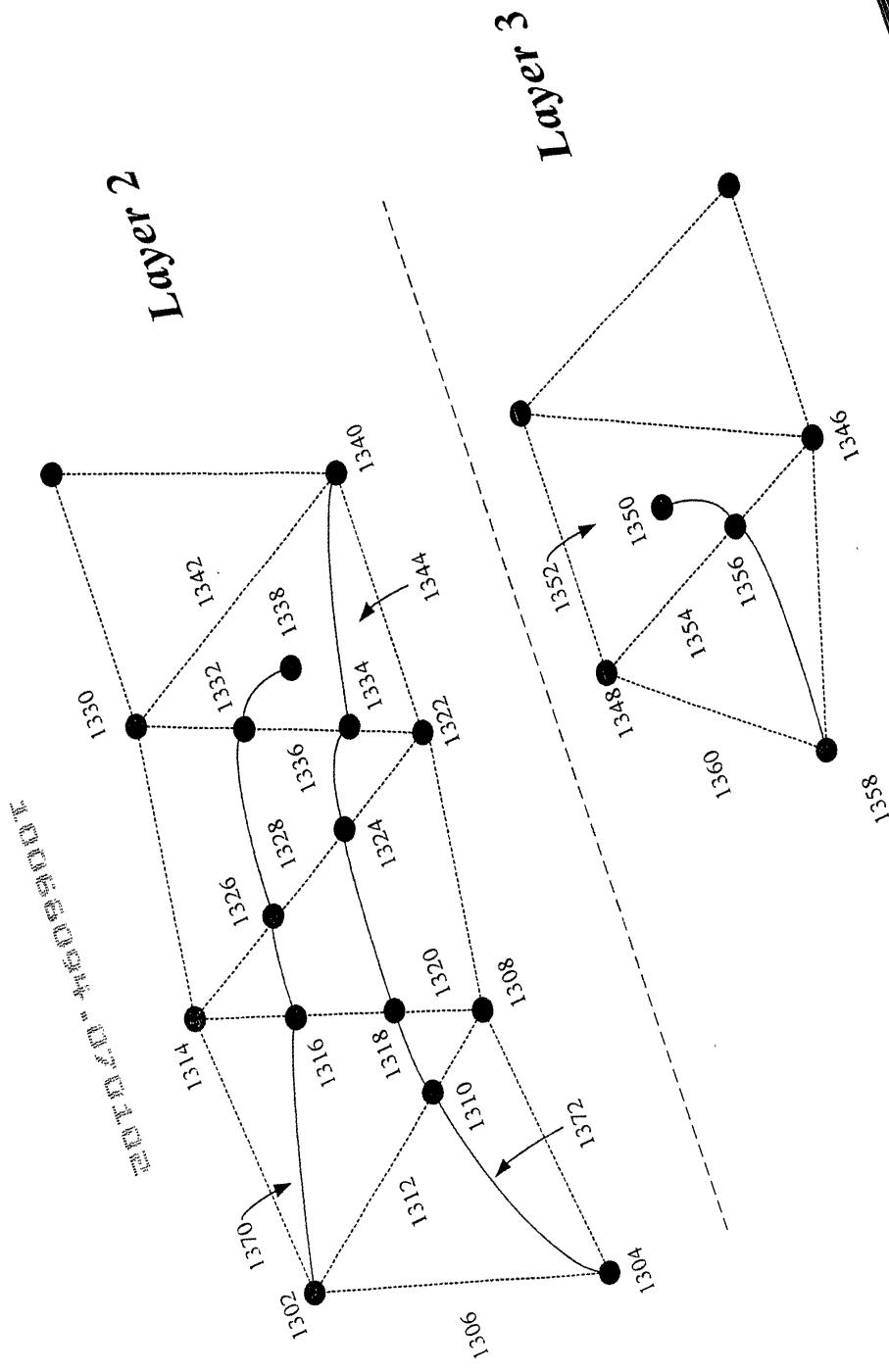
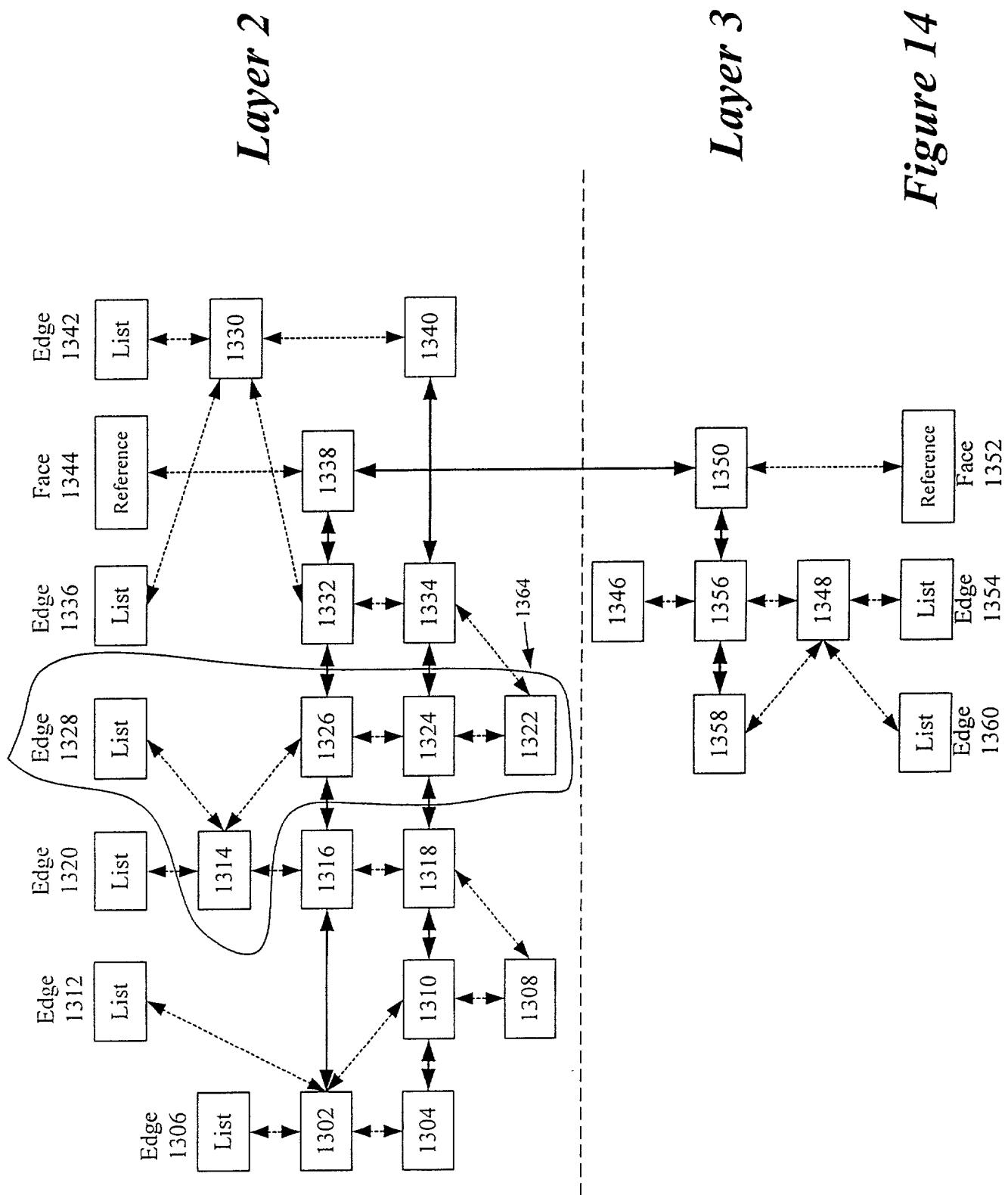
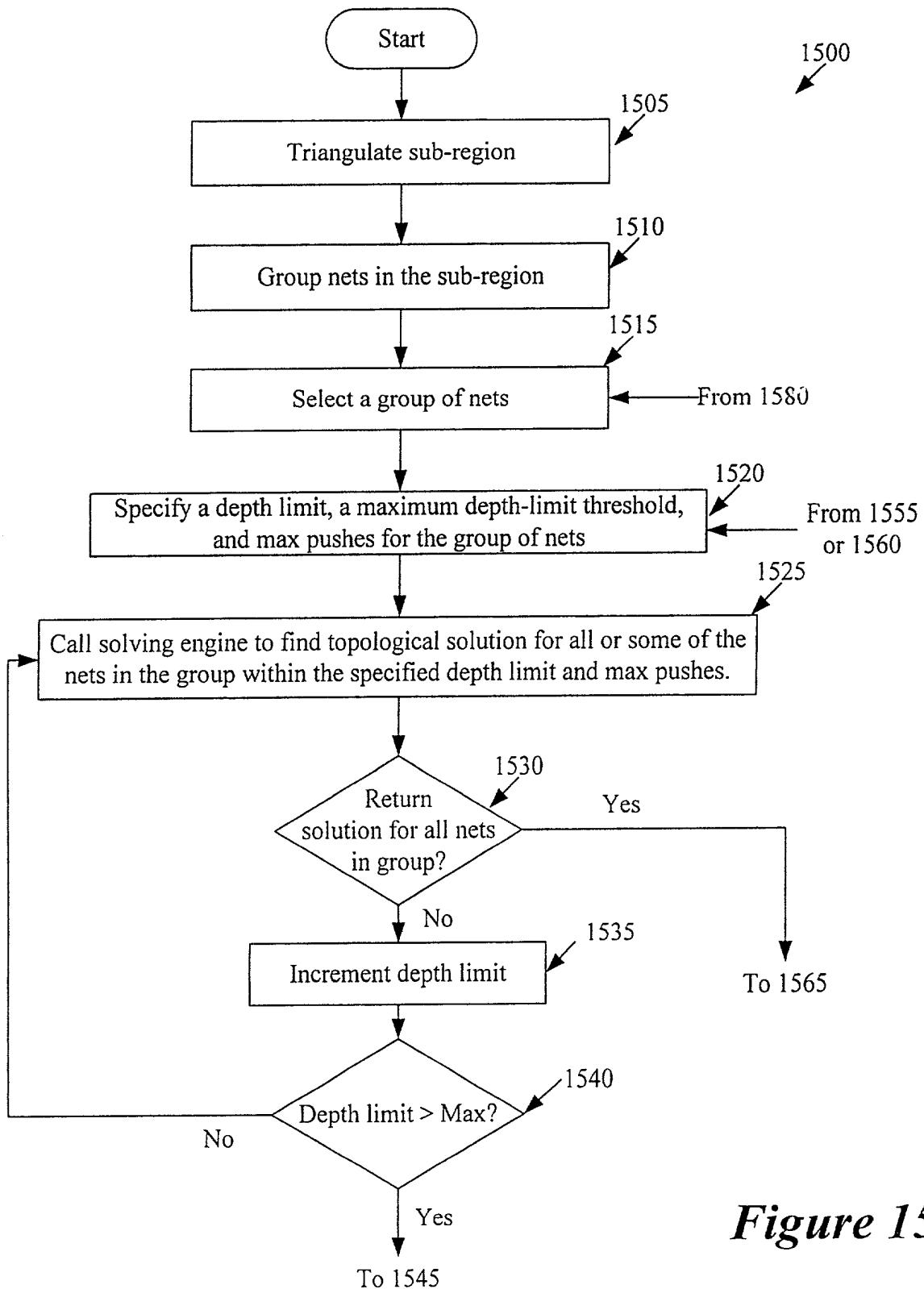


Figure 13

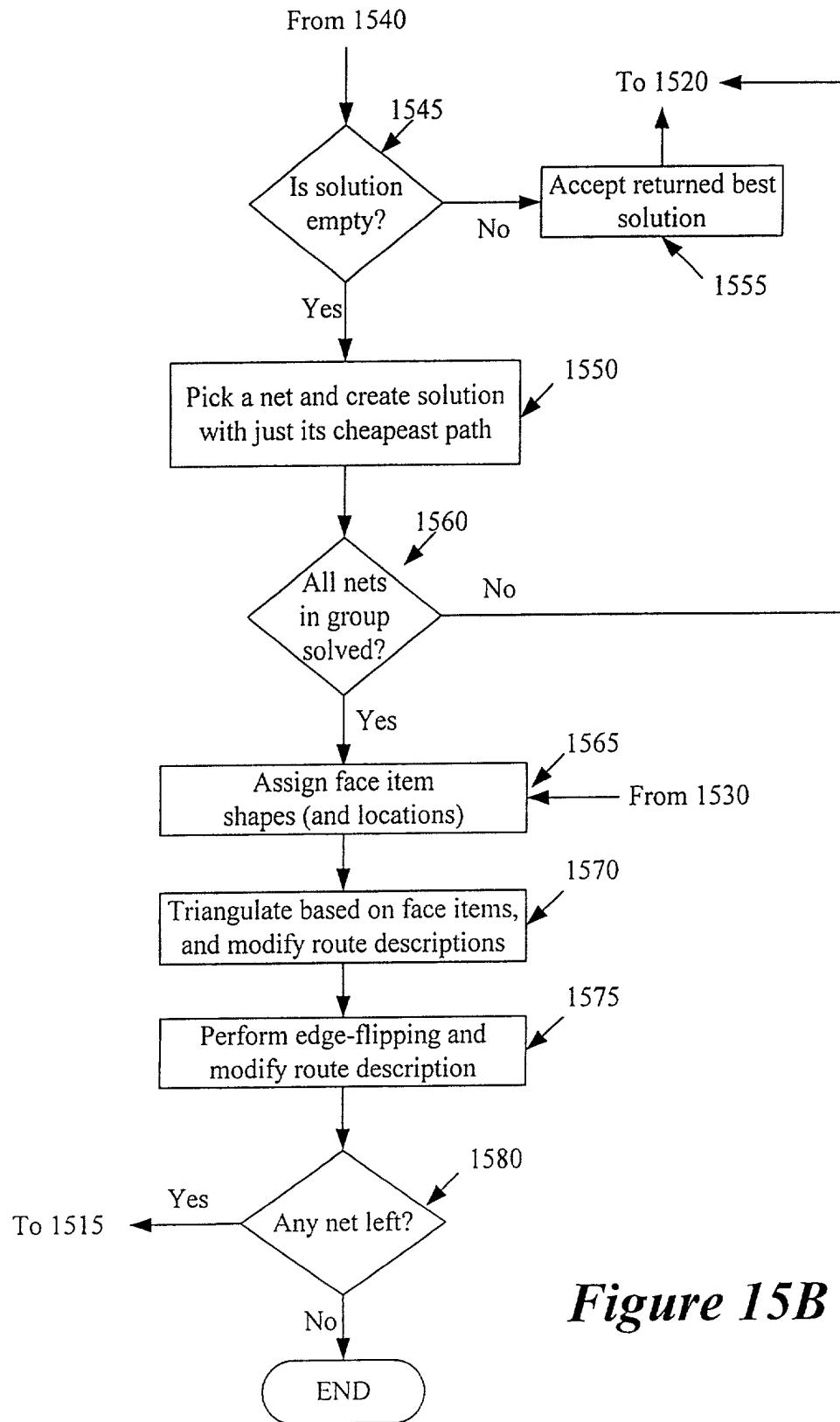
Figure 14



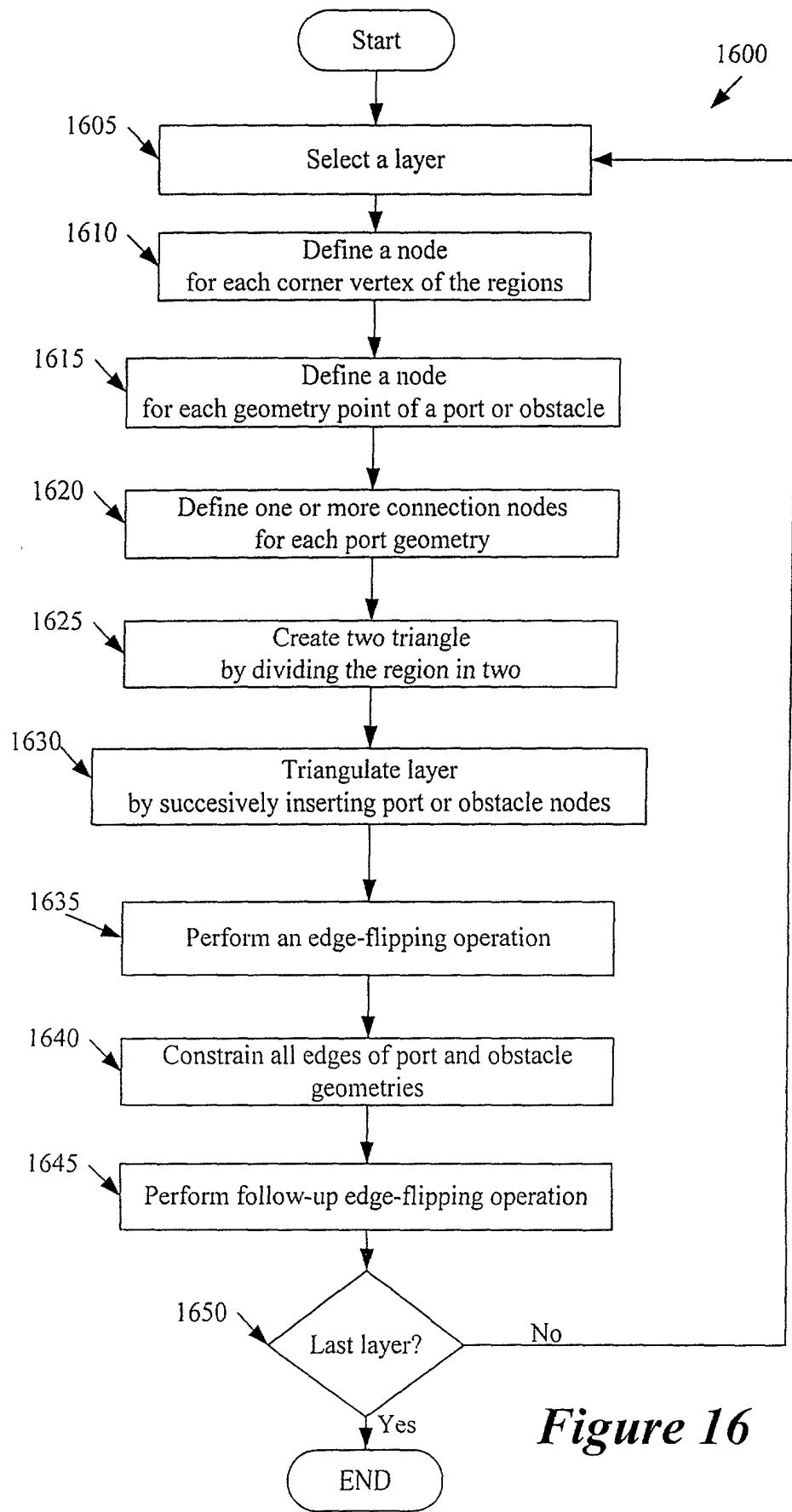


**Figure 15A**

**Figure 15:** *Figure 15A*  
*Figure 15B*



**Figure 15B**



**Figure 16**

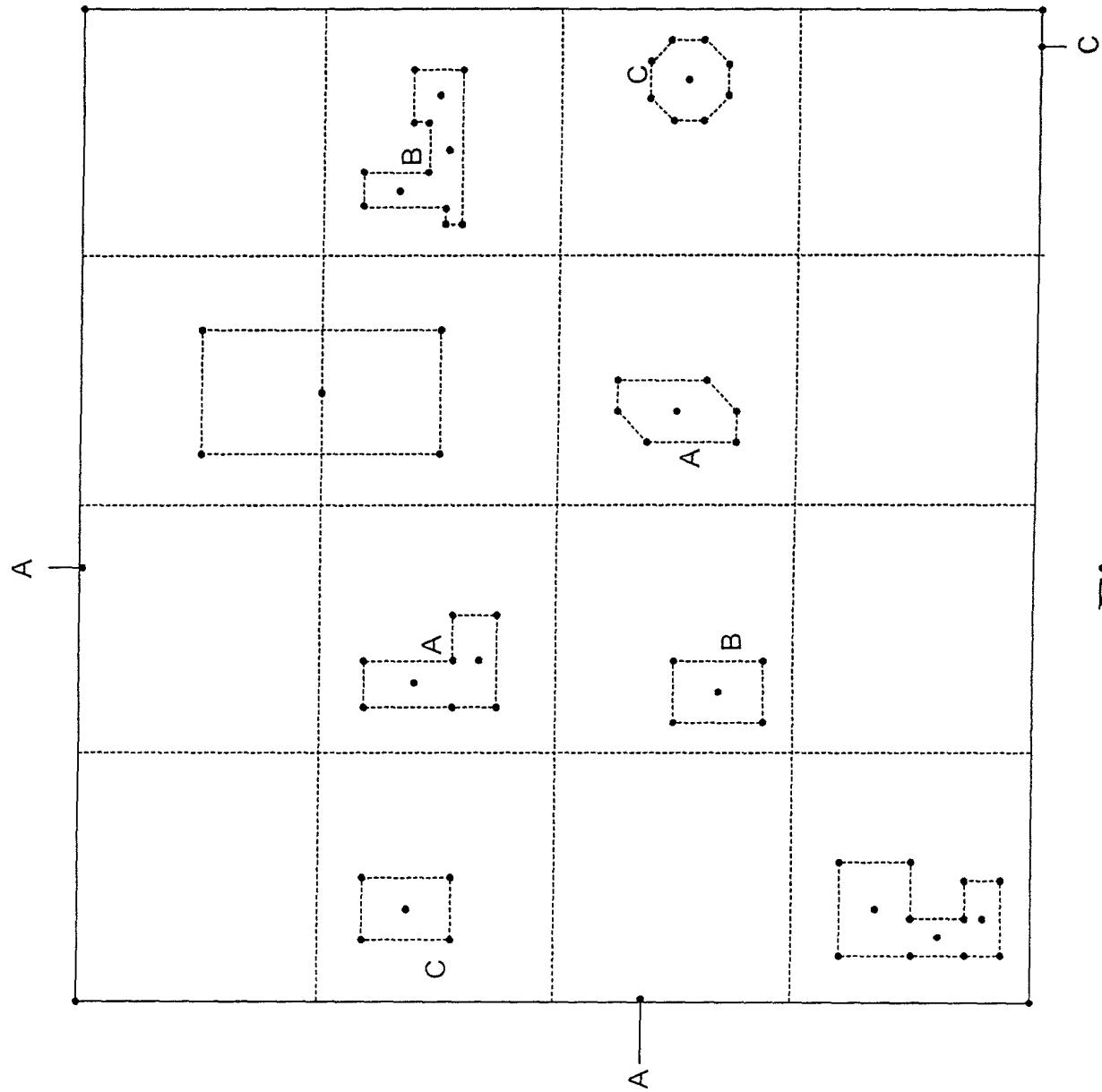


Figure 17

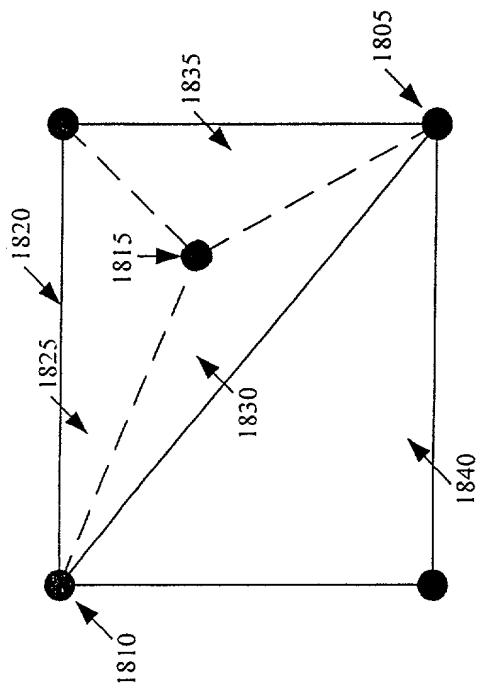


Figure 18

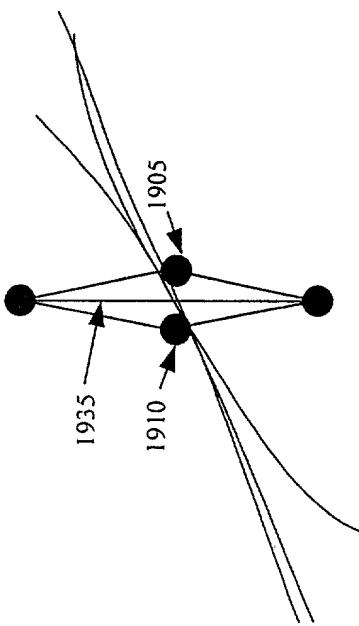


Figure 19

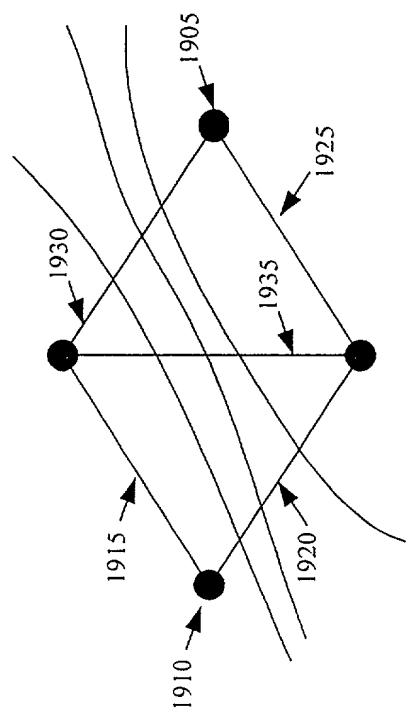
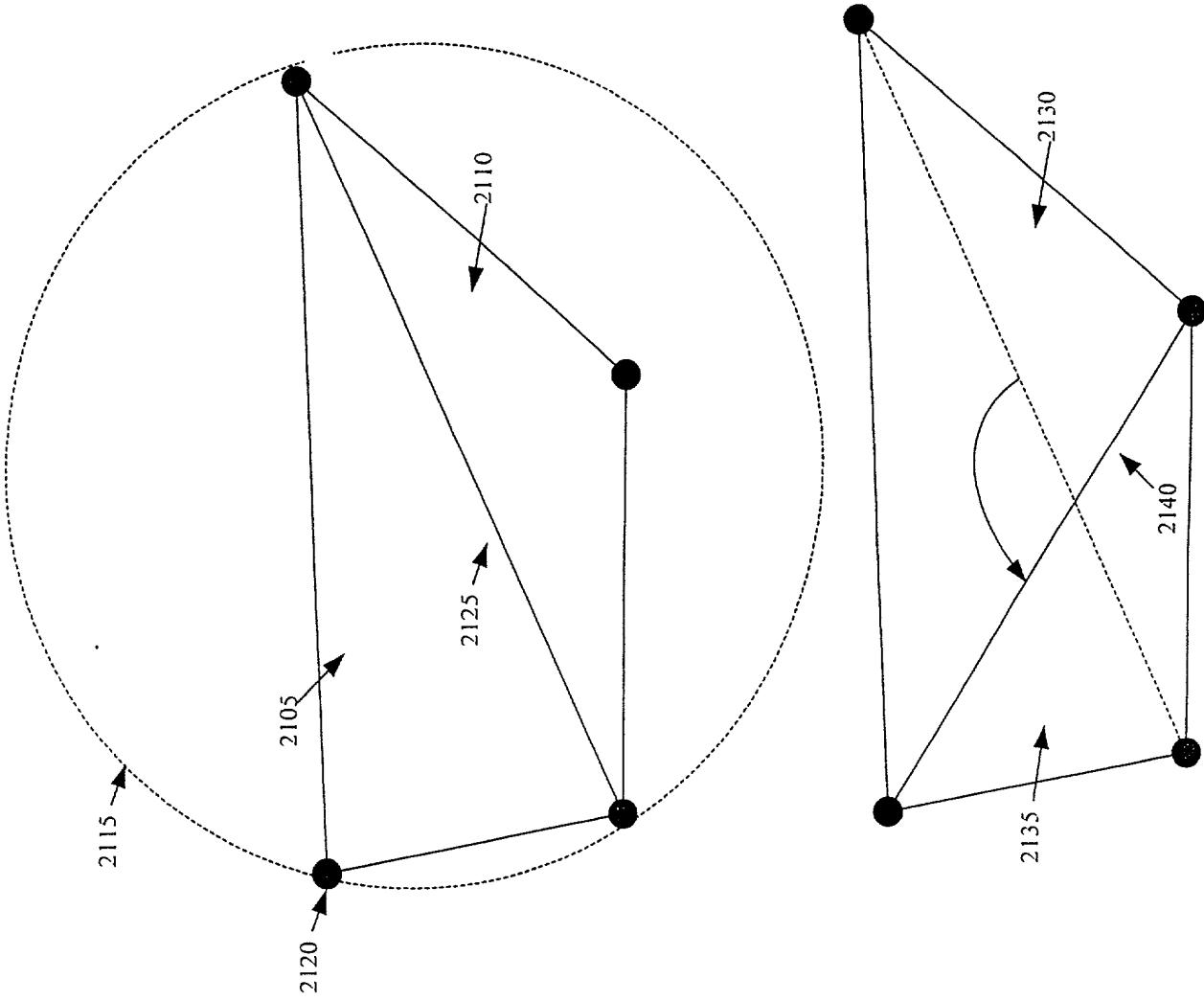


Figure 20

*Figure 21*



*Figure 22*

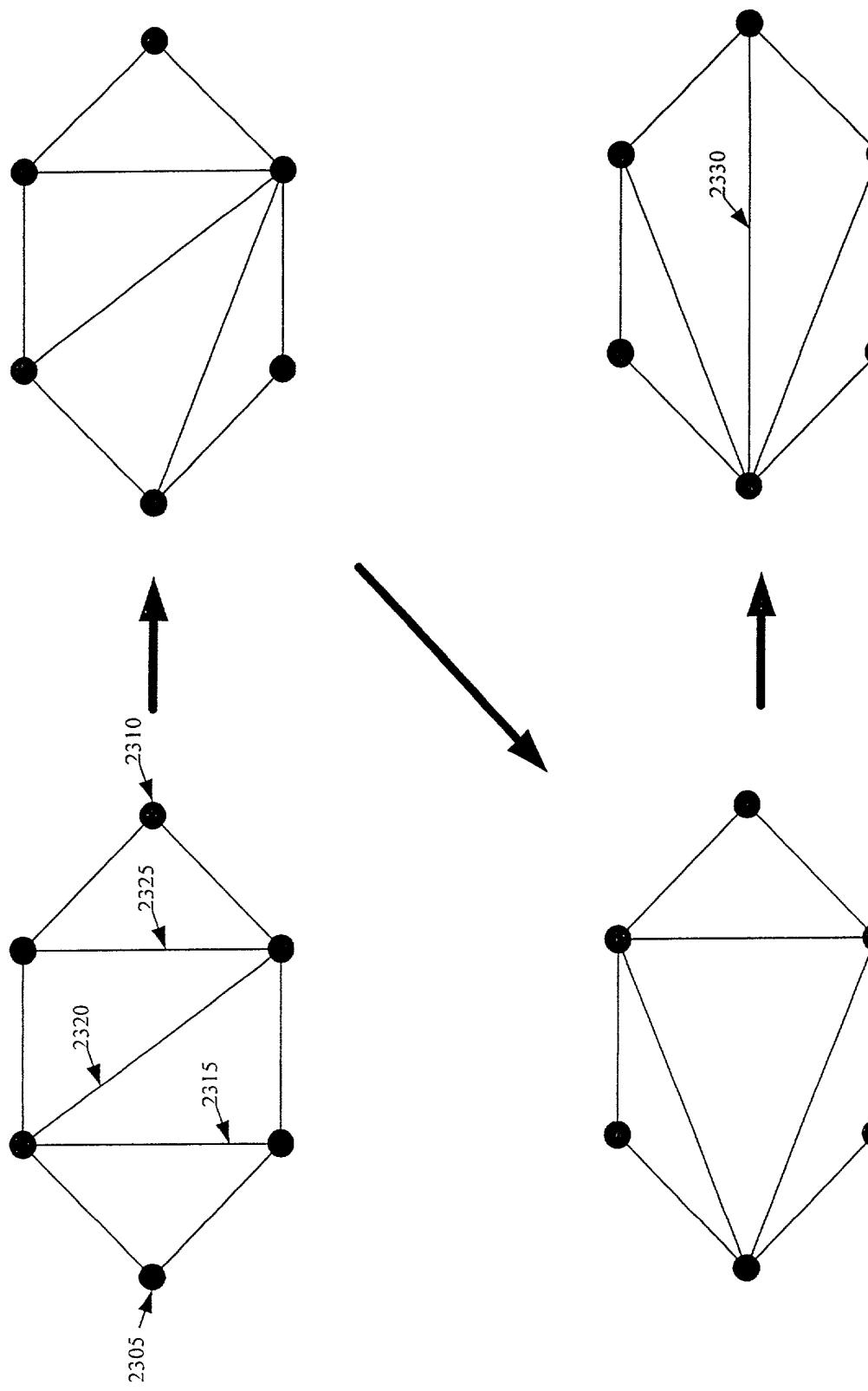
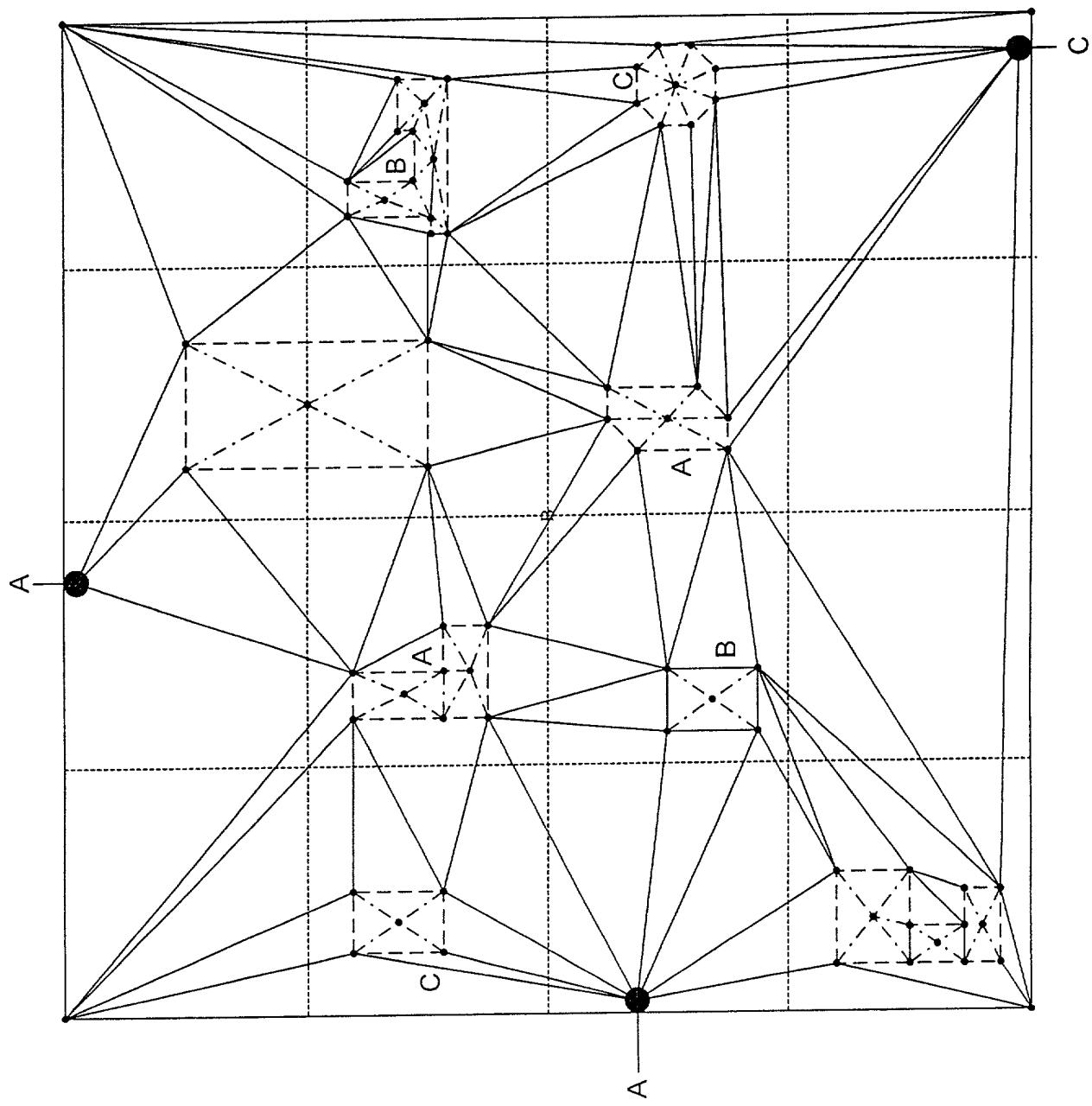
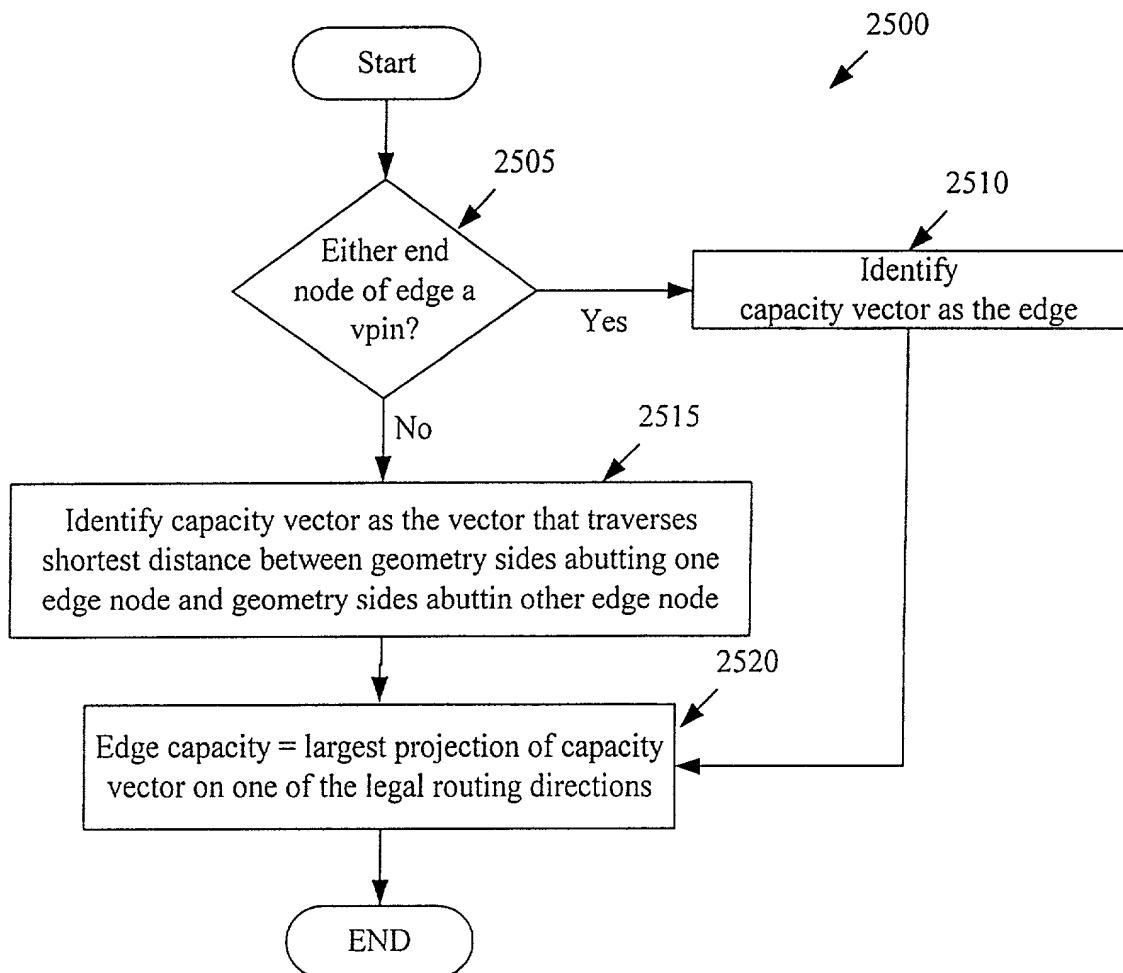


Figure 23

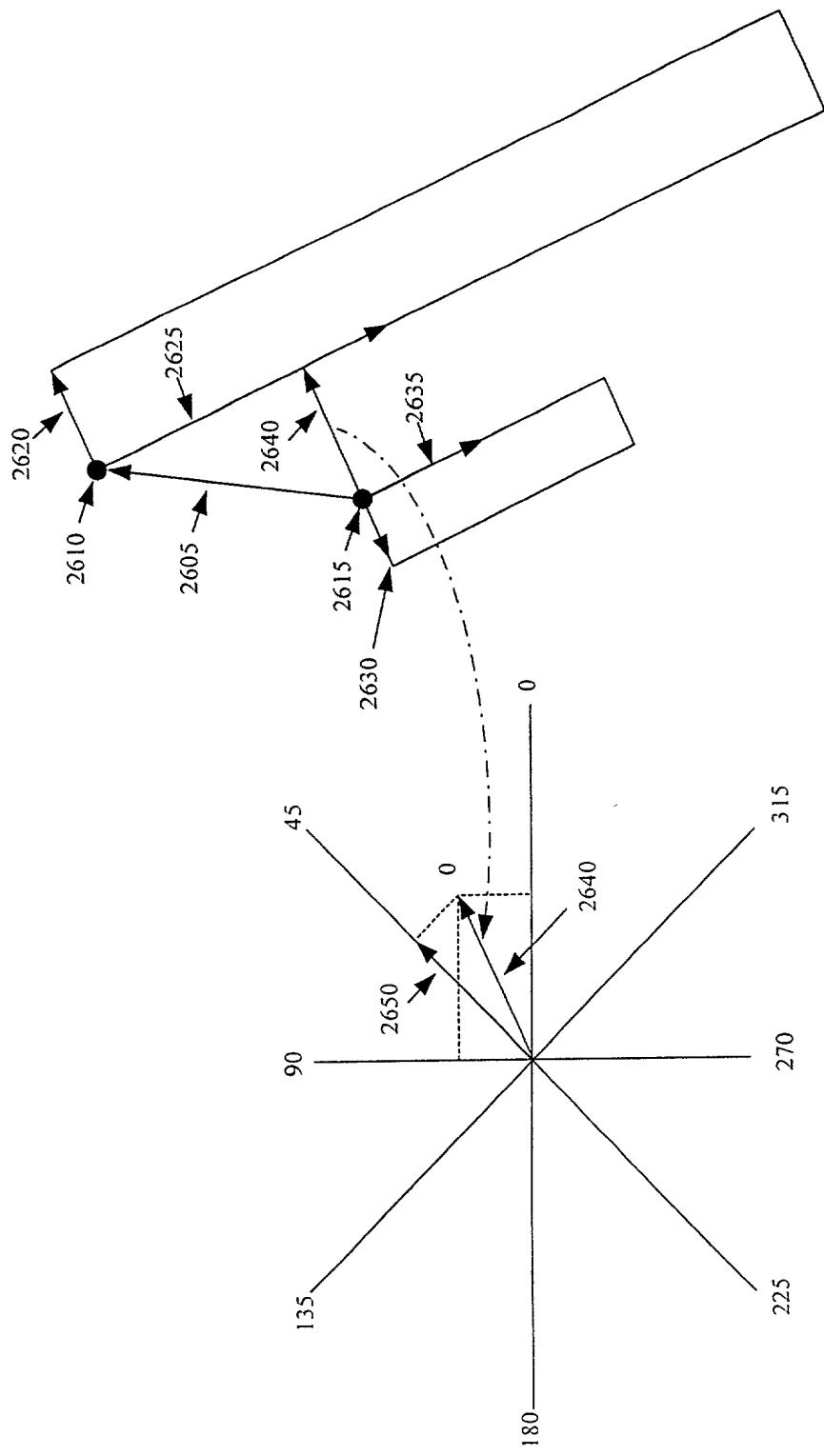
Figure 24

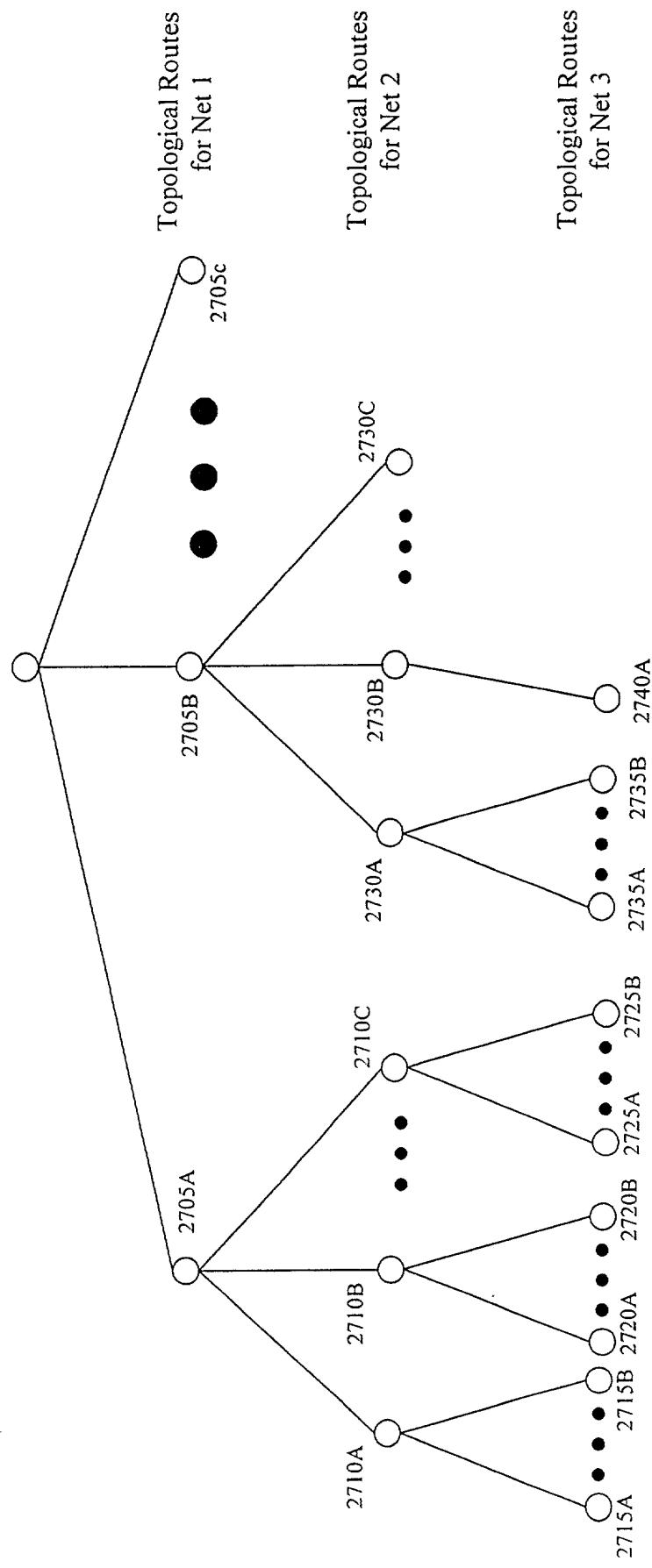




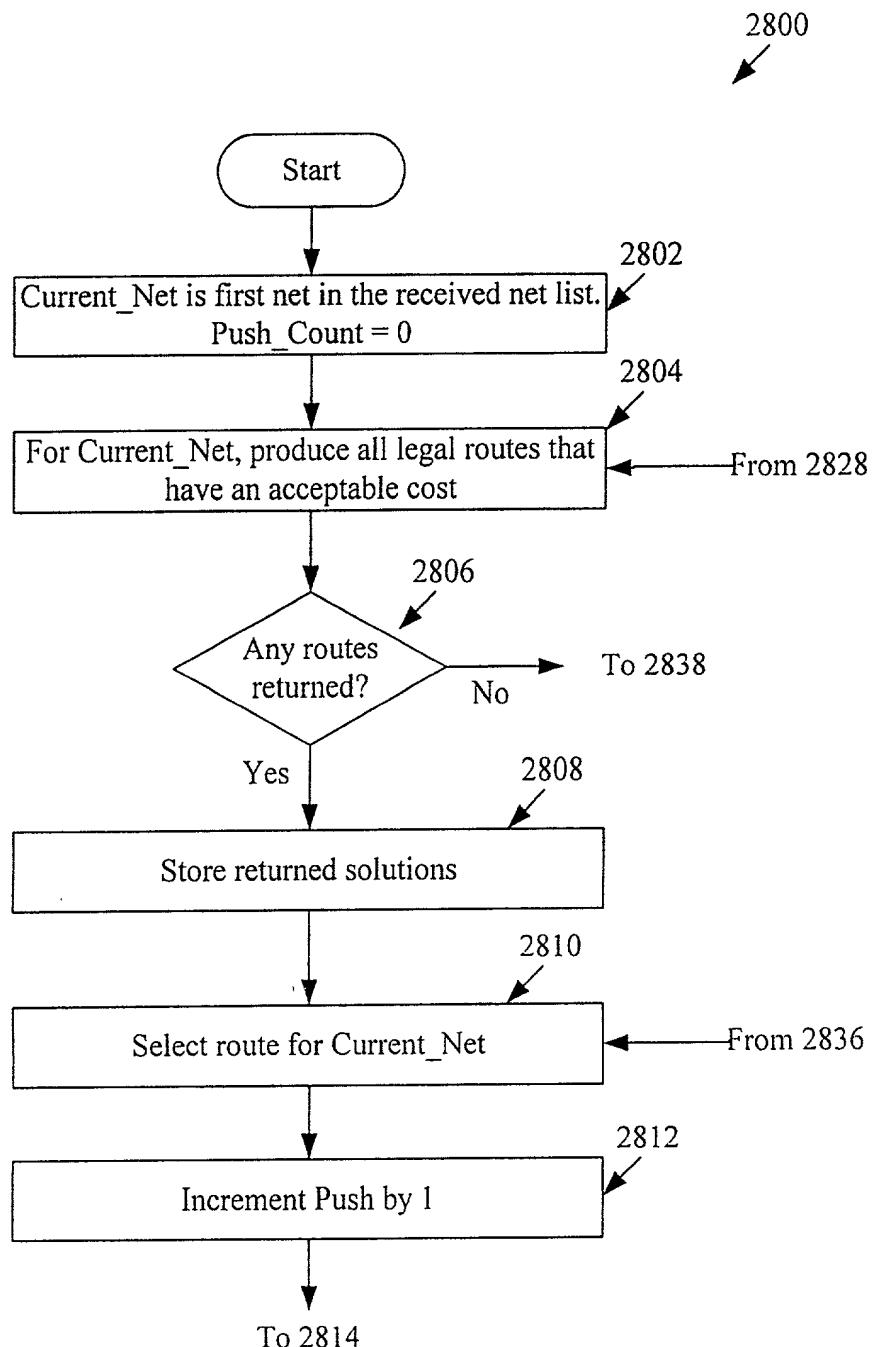
*Figure 25*

Figure 26



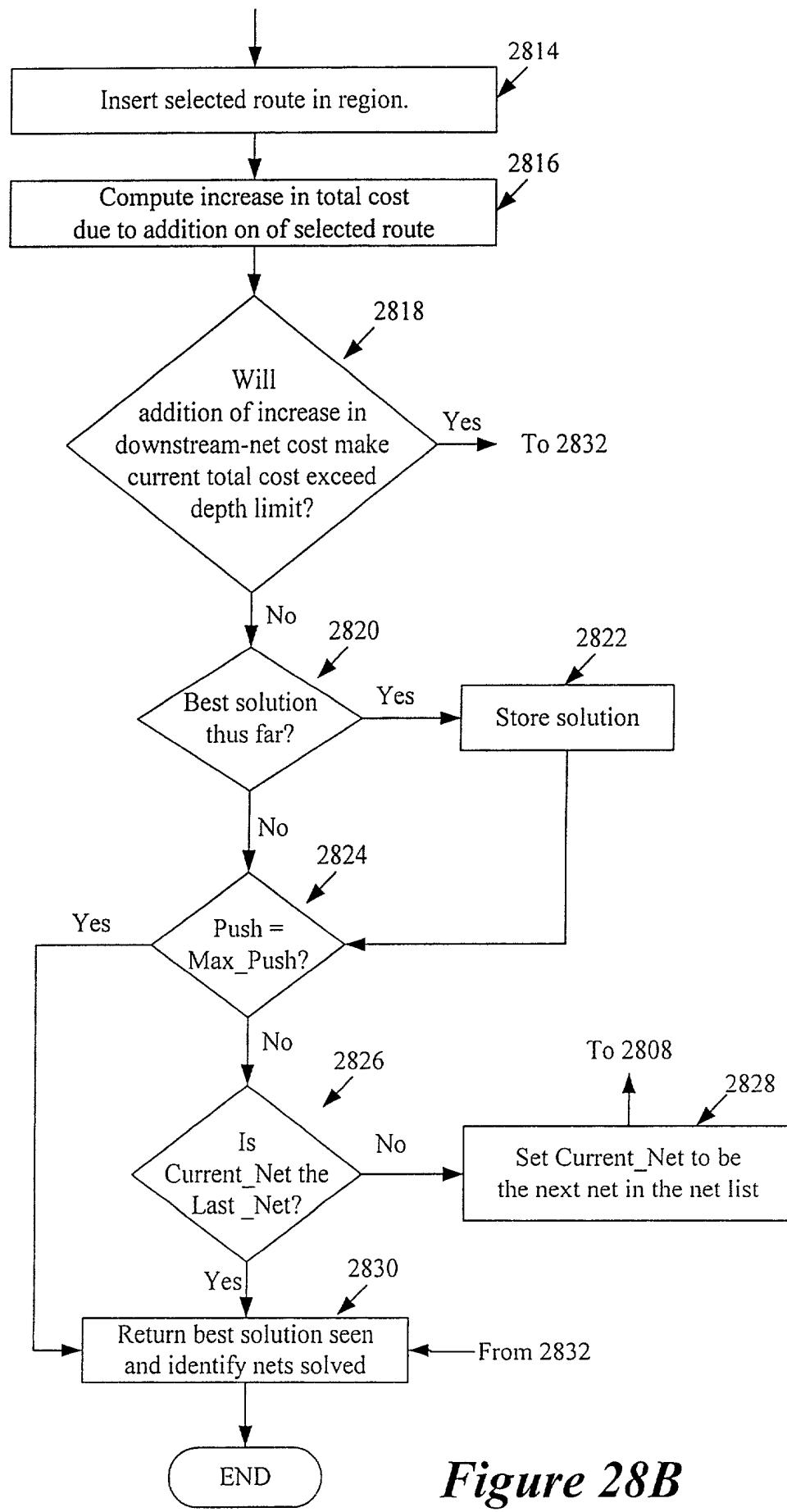


*Figure 27*

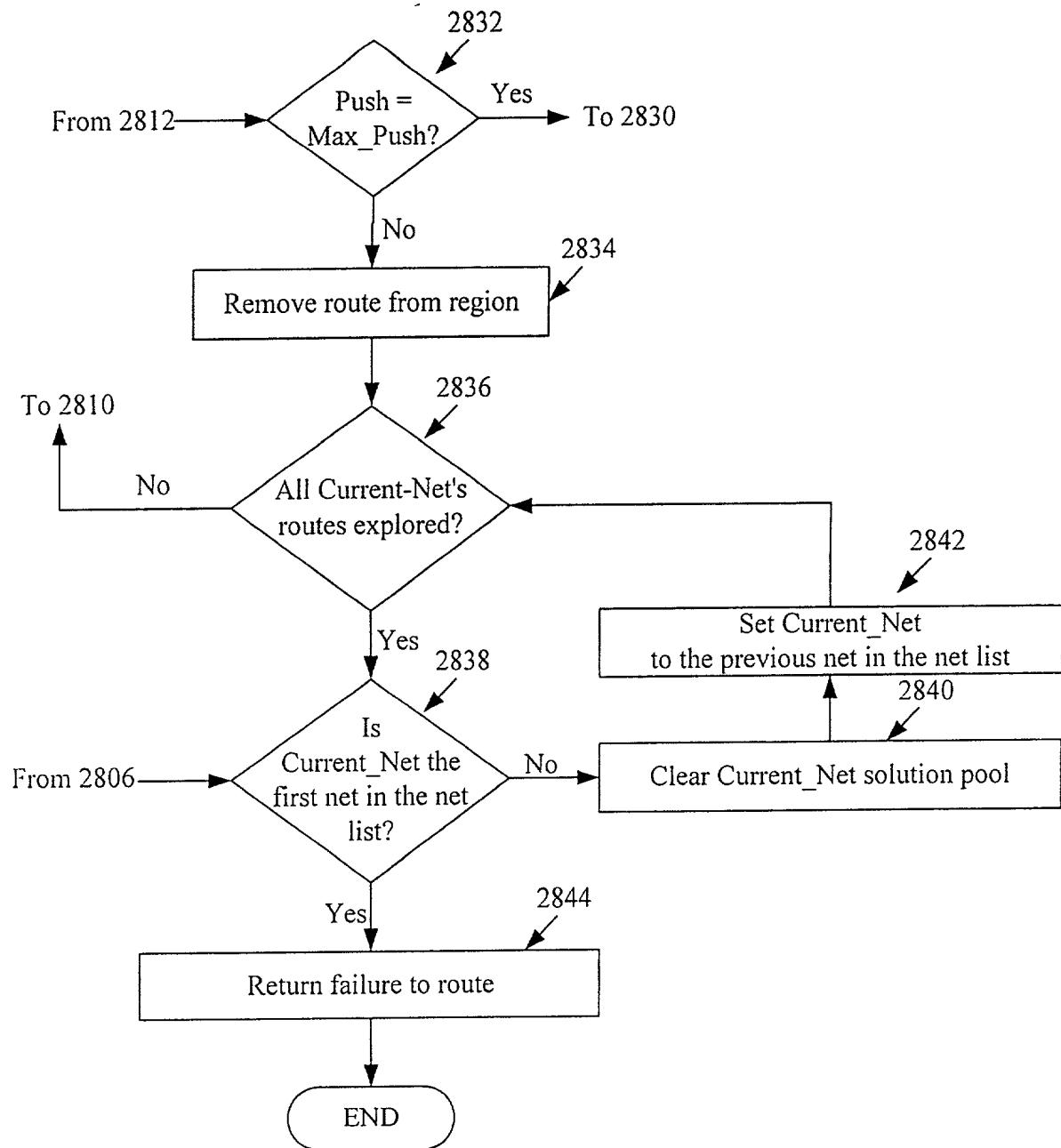


*Figure 28A*

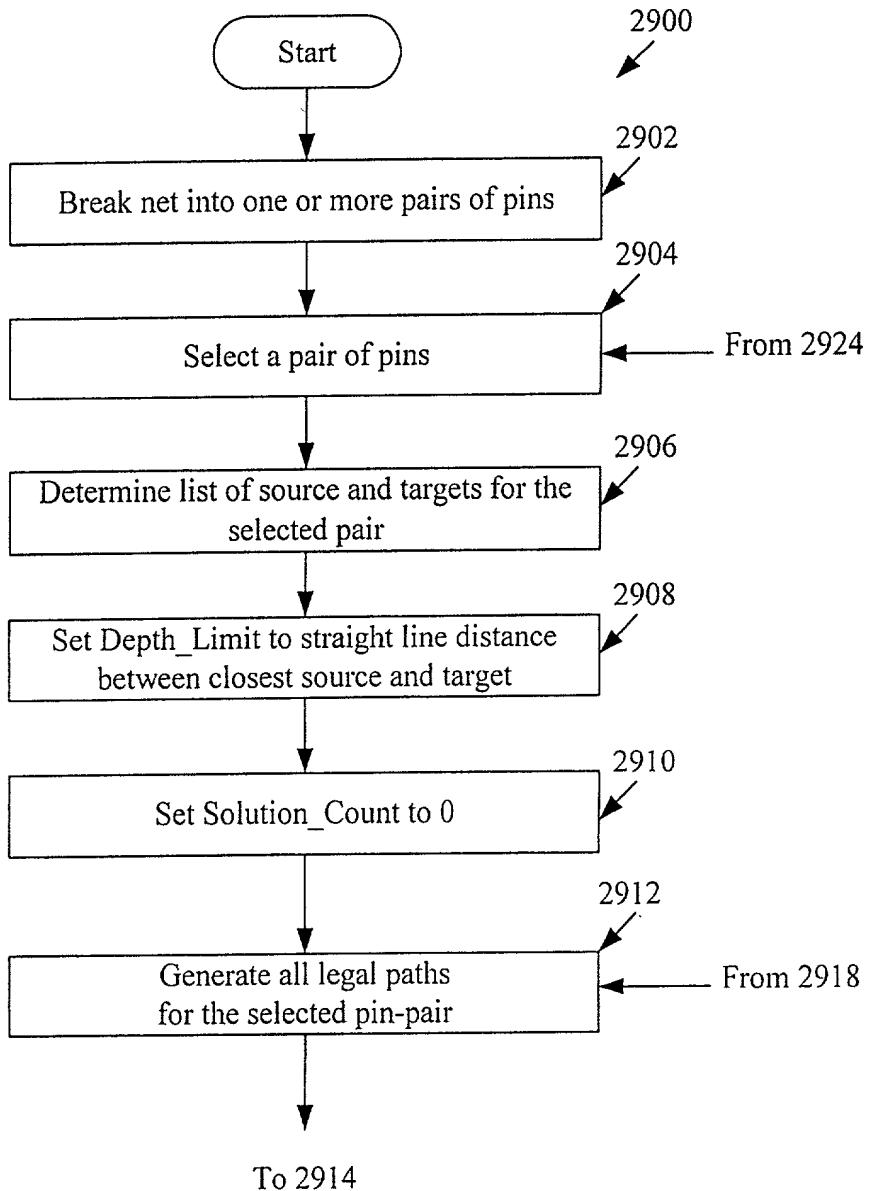
*Figure 28:  $\frac{\text{Figure 28A}}{\text{Figure 28B}}$*   
 $\frac{\text{Figure 28B}}{\text{Figure 28C}}$



**Figure 28B**



*Figure 28C*



*Figure 29A*

*Figure 29:  $\frac{\text{Figure 29A}}{\text{Figure 29B}}$*

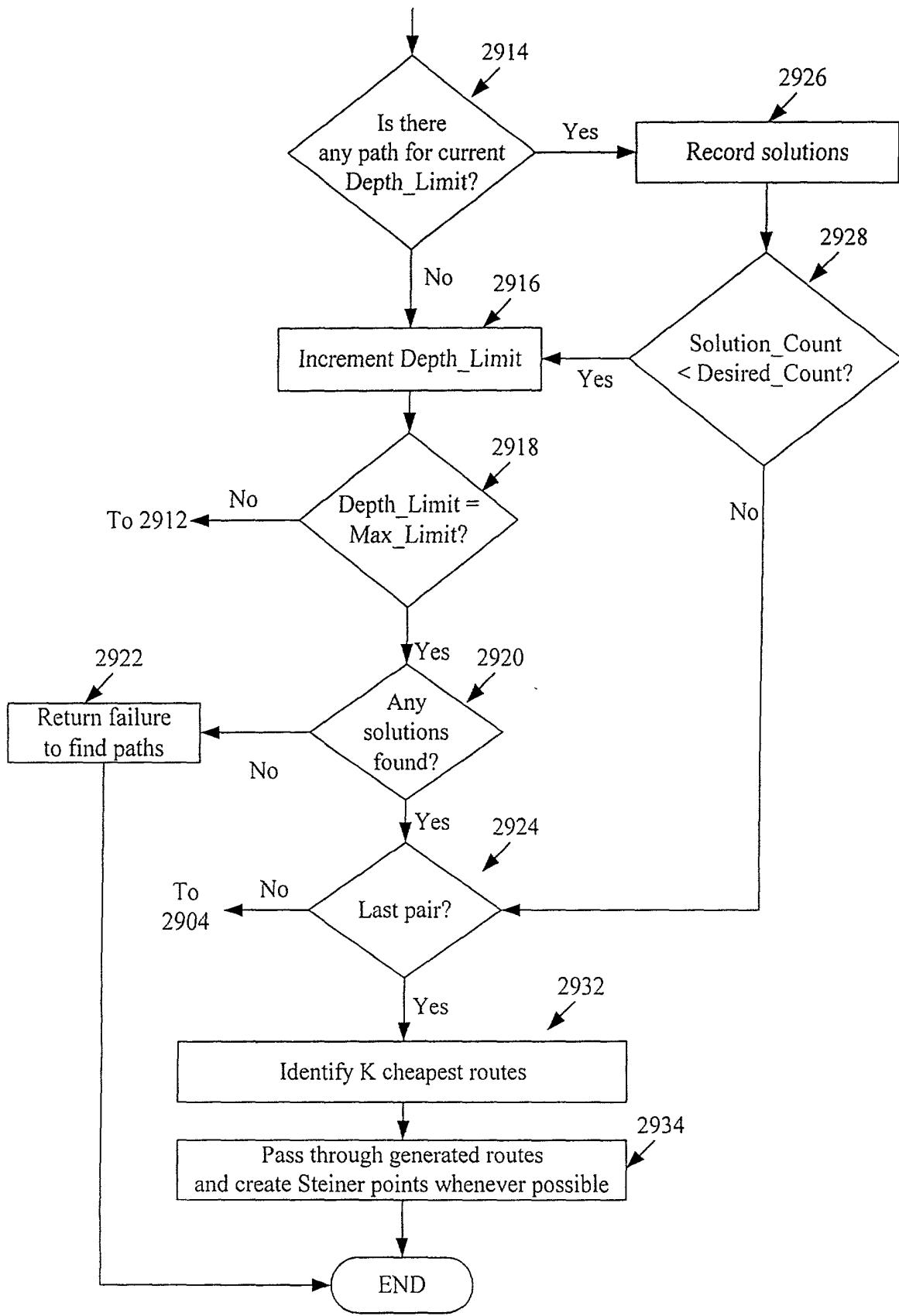


Figure 29B

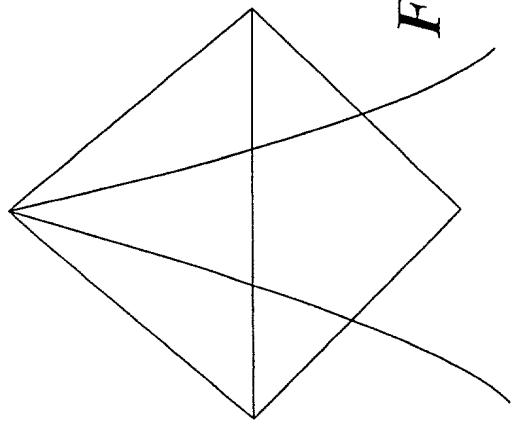


Figure 30A

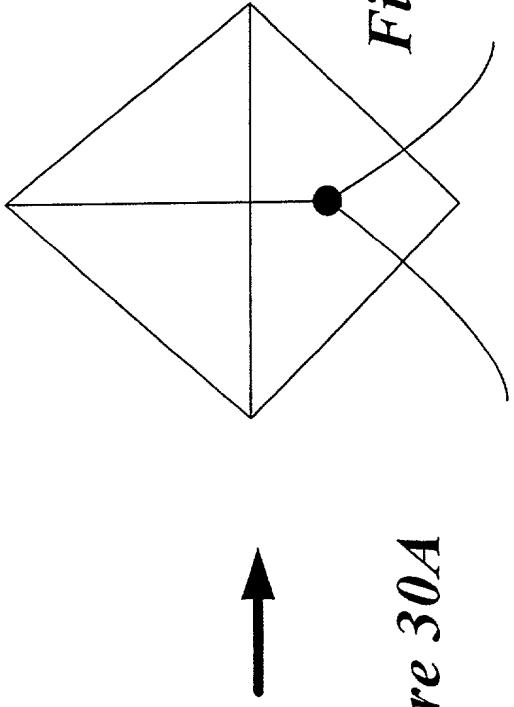


Figure 30B

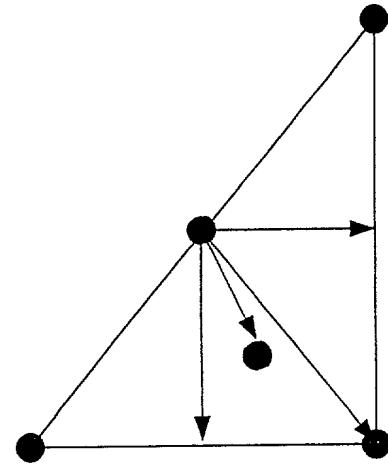


Figure 32

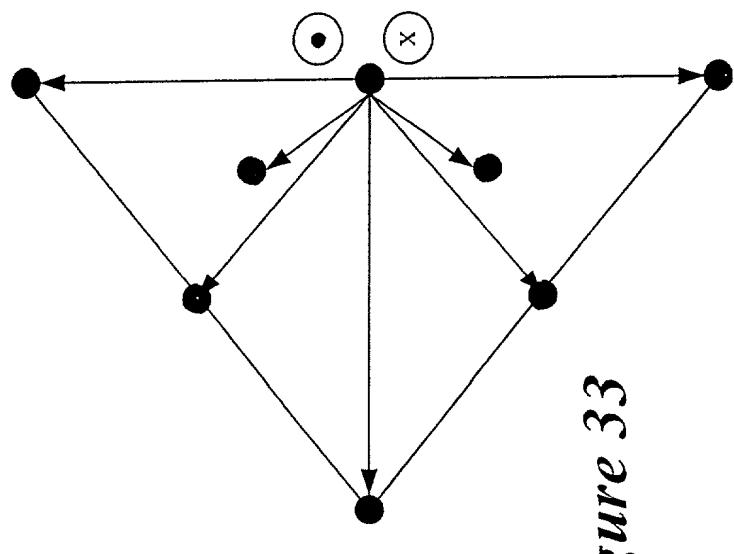


Figure 33

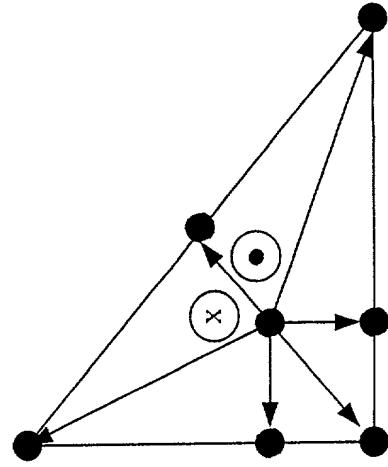
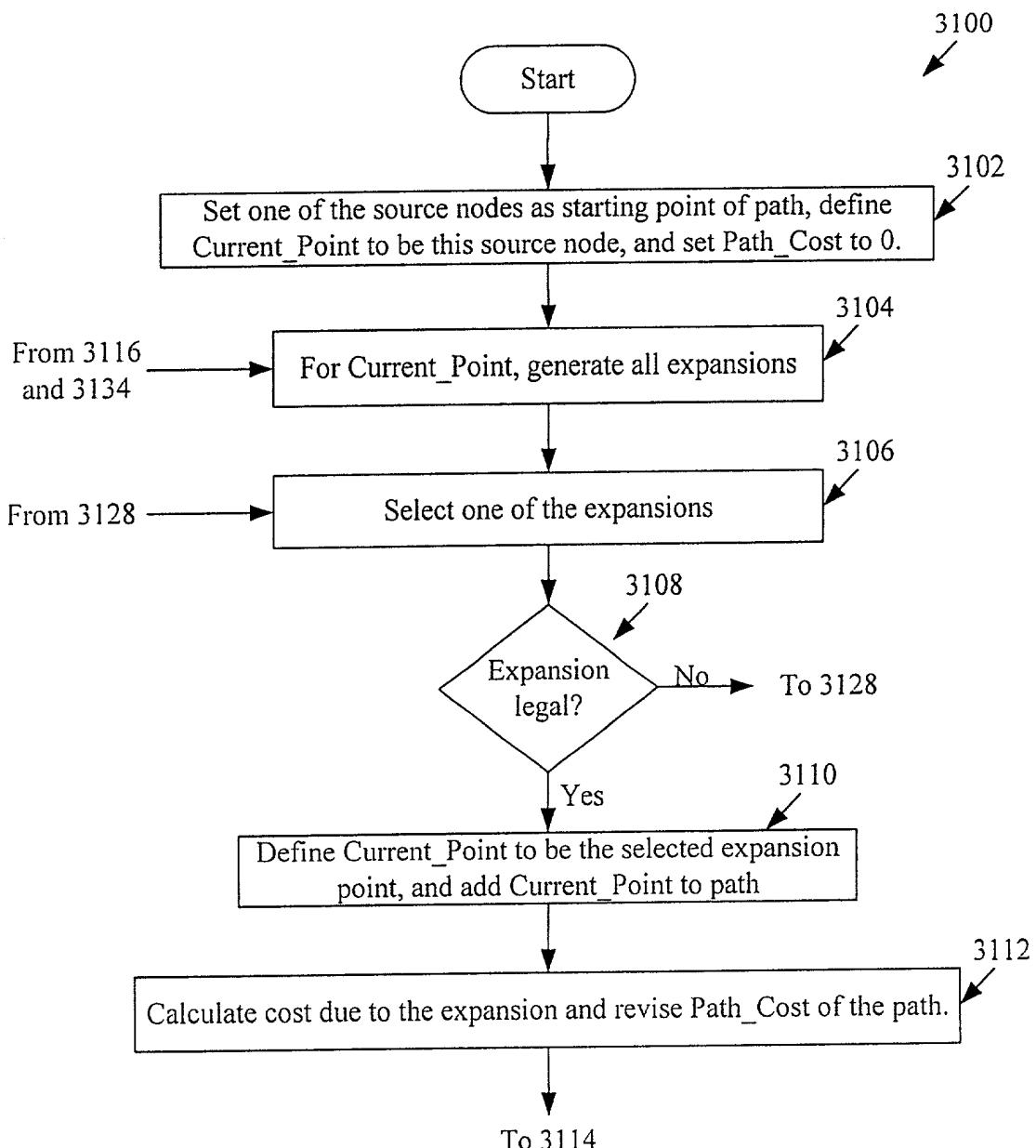
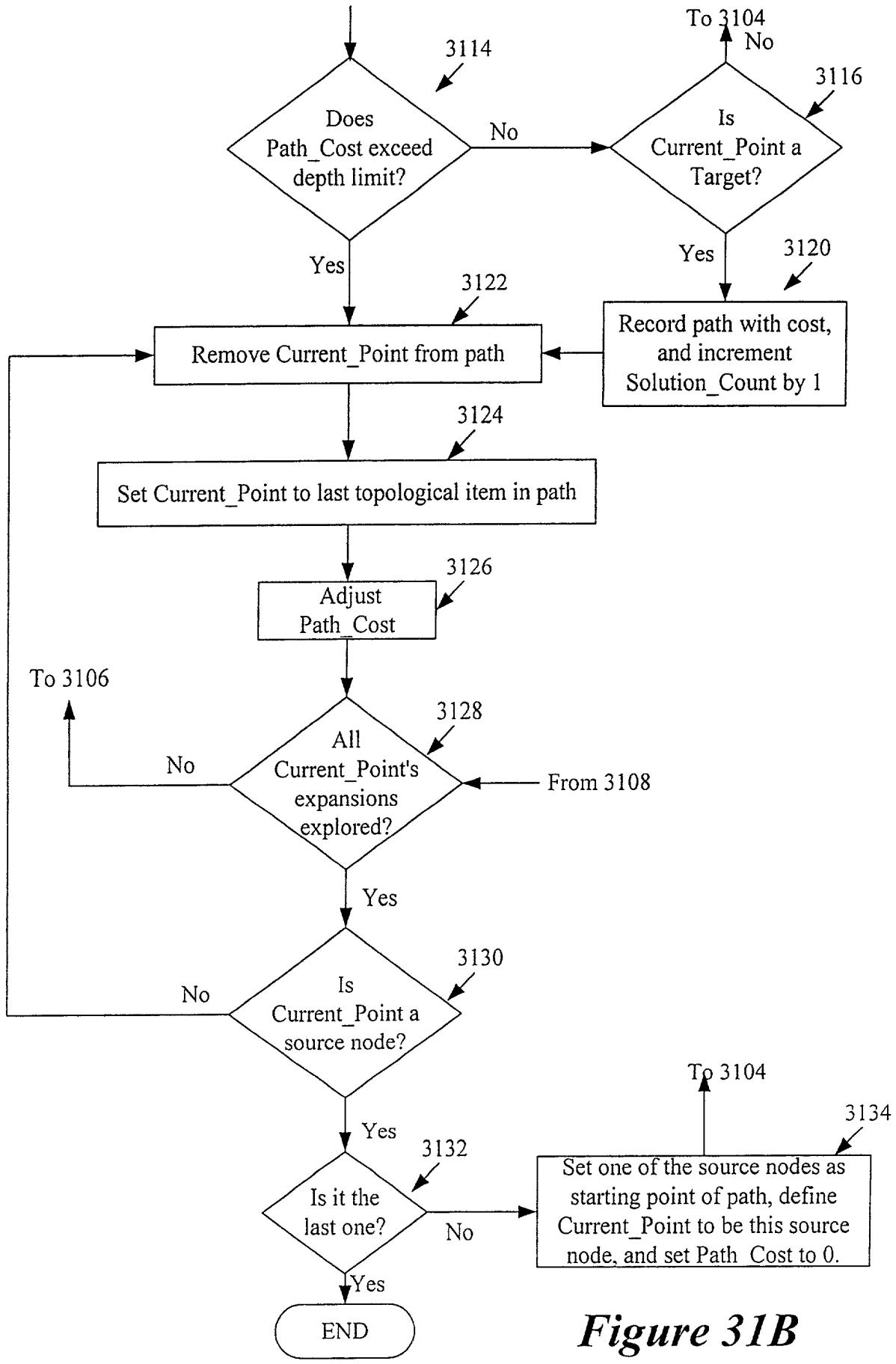


Figure 34



*Figure 31A*

*Figure 31:  $\frac{\text{Figure 31A}}{\text{Figure 31B}}$*



*Figure 31B*

Figure 38A

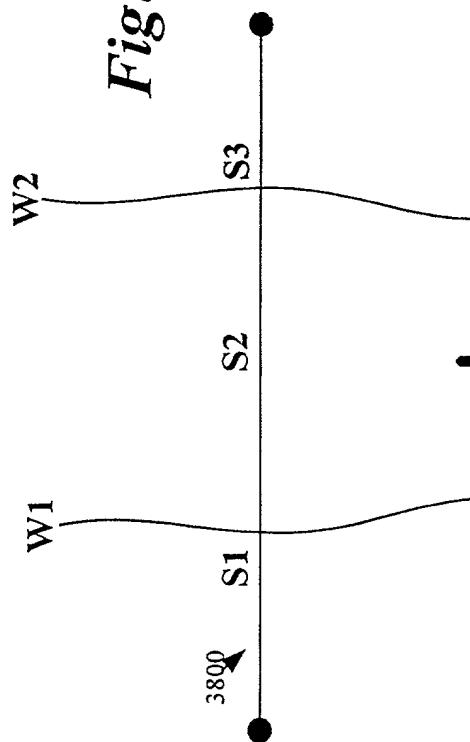


Figure 35

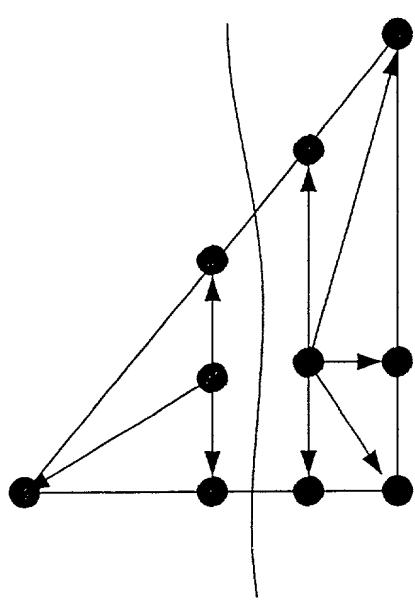


Figure 38B

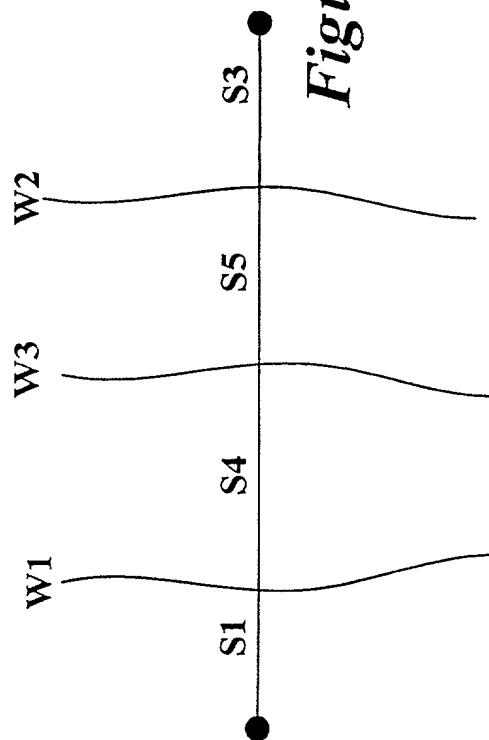
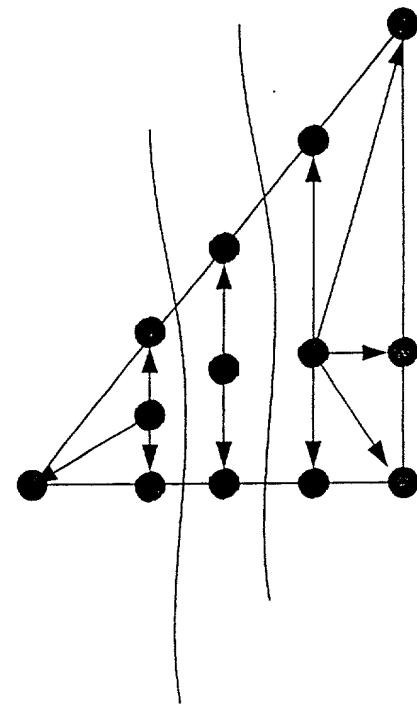
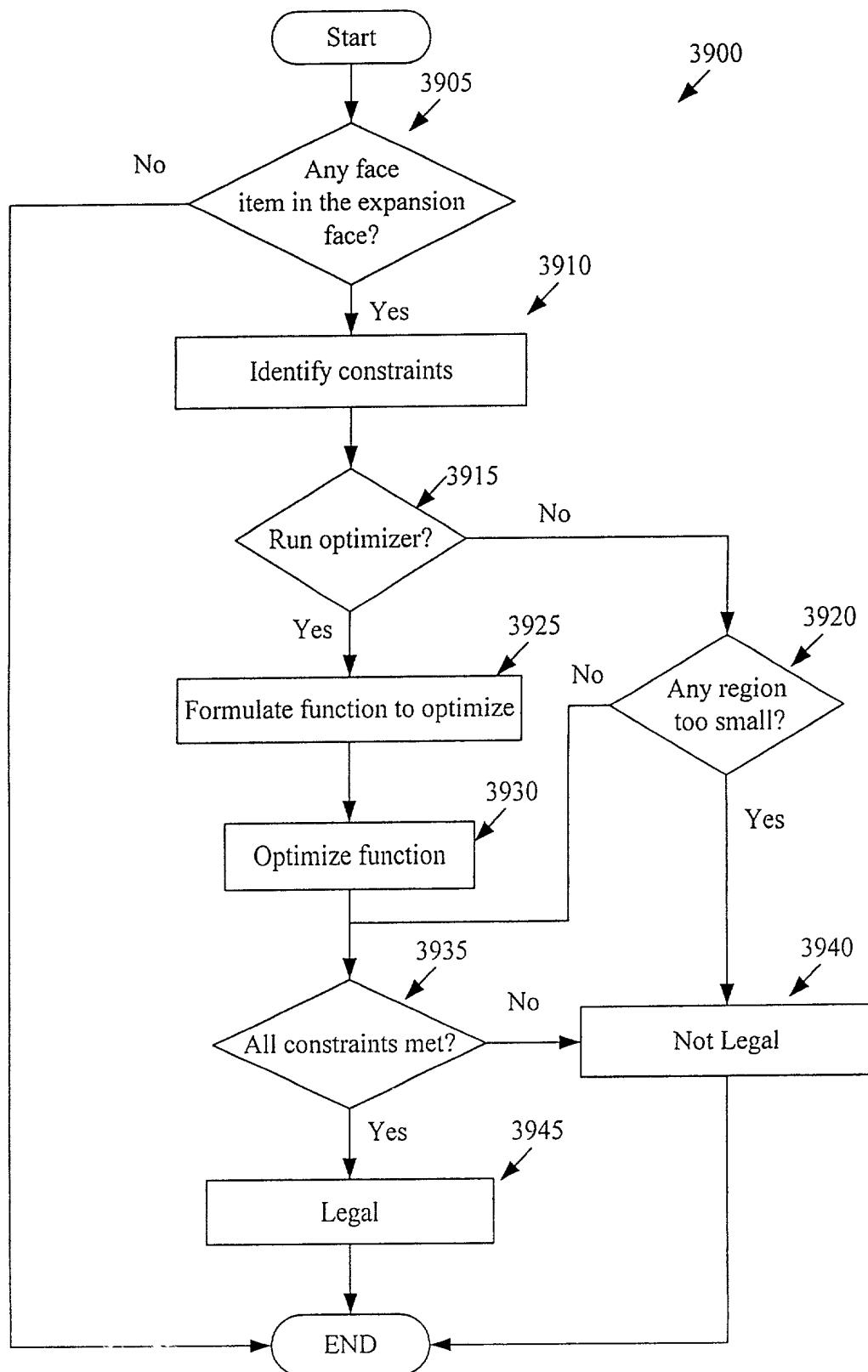


Figure 36

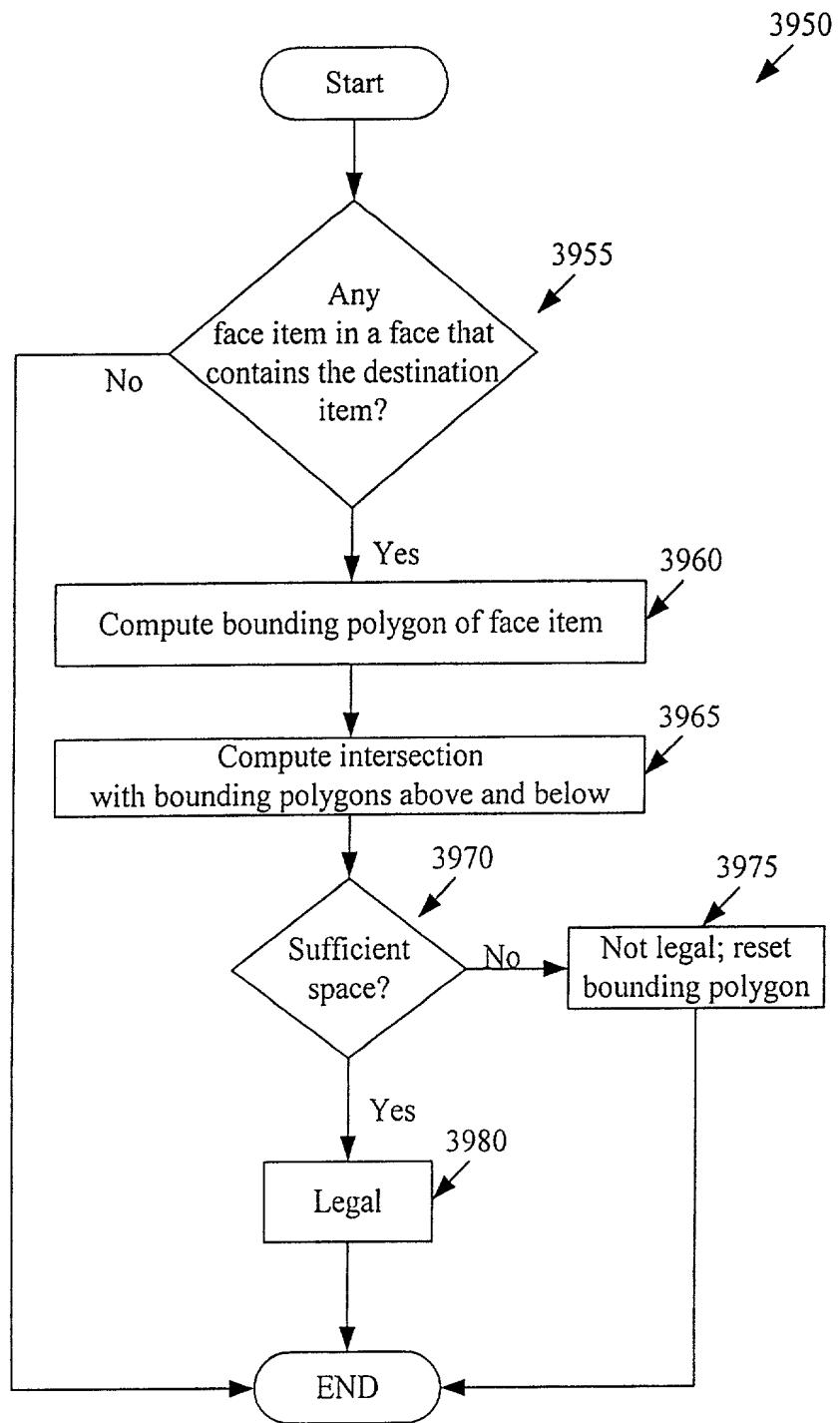


From:	To:	Node	Face Item	Edge Item
Node	• Planarity	• Vias	• Vias	• Planarity • Vias • Edge Capacity
	• Vias	• Vias	• Vias	• Vias • Edge Capacity
				• Planarity • Vias • Edge Capacity

*Figure 37*



*Figure 39A*



*Figure 39B*

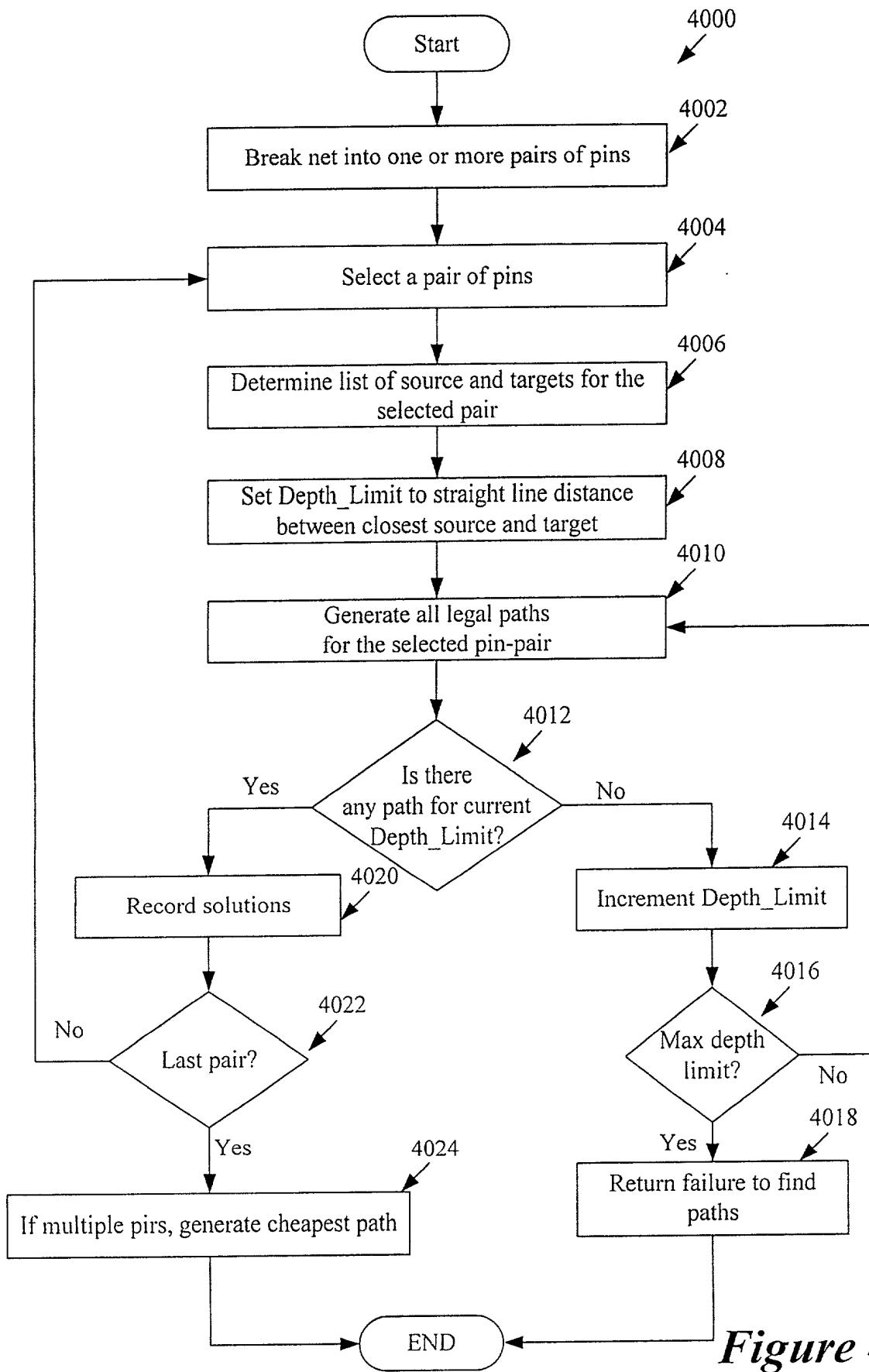
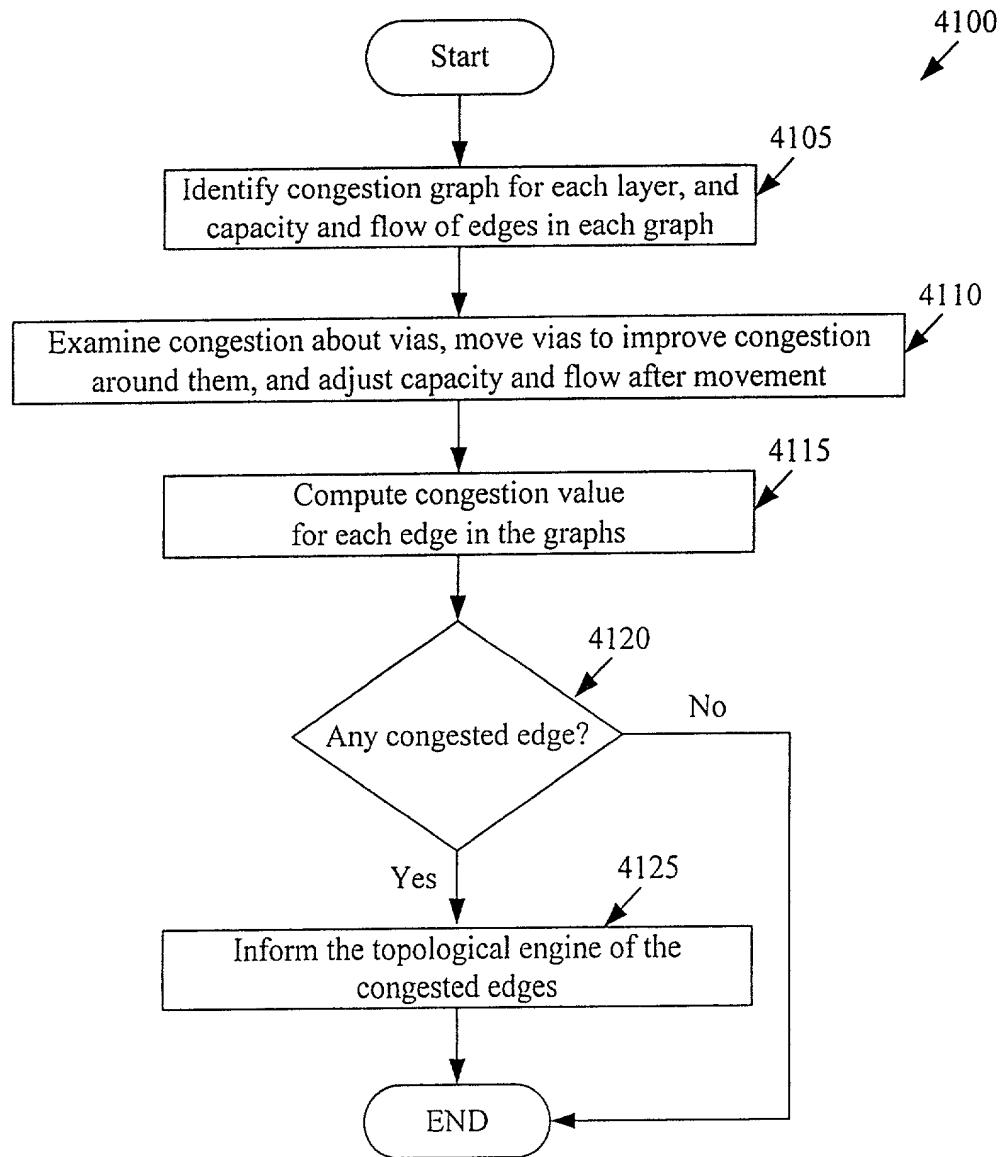
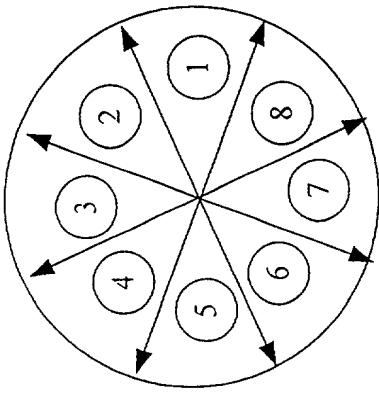


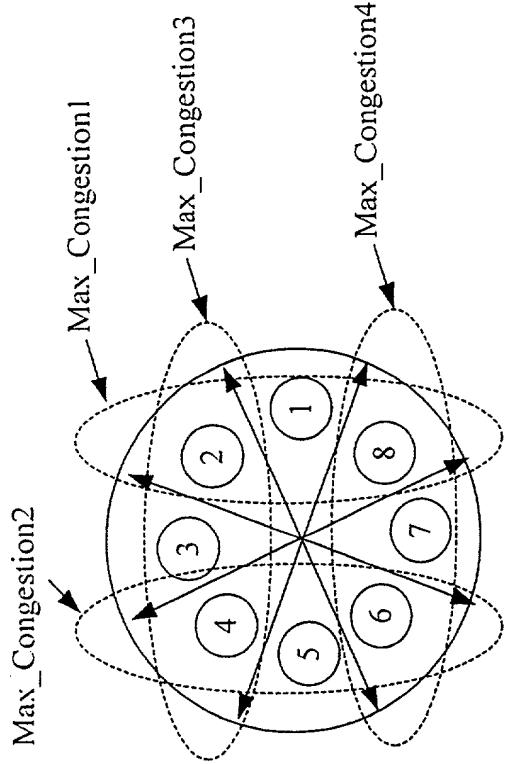
Figure 40



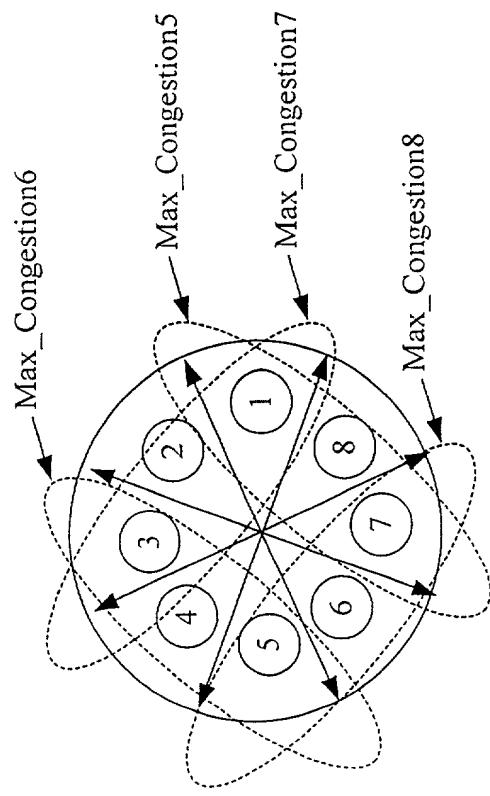
*Figure 41*



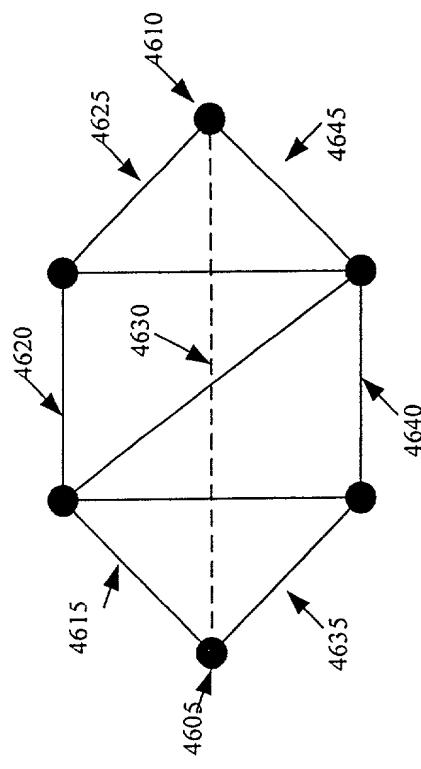
*Figure 42*



*Figure 44*



*Figure 45*



*Figure 46*

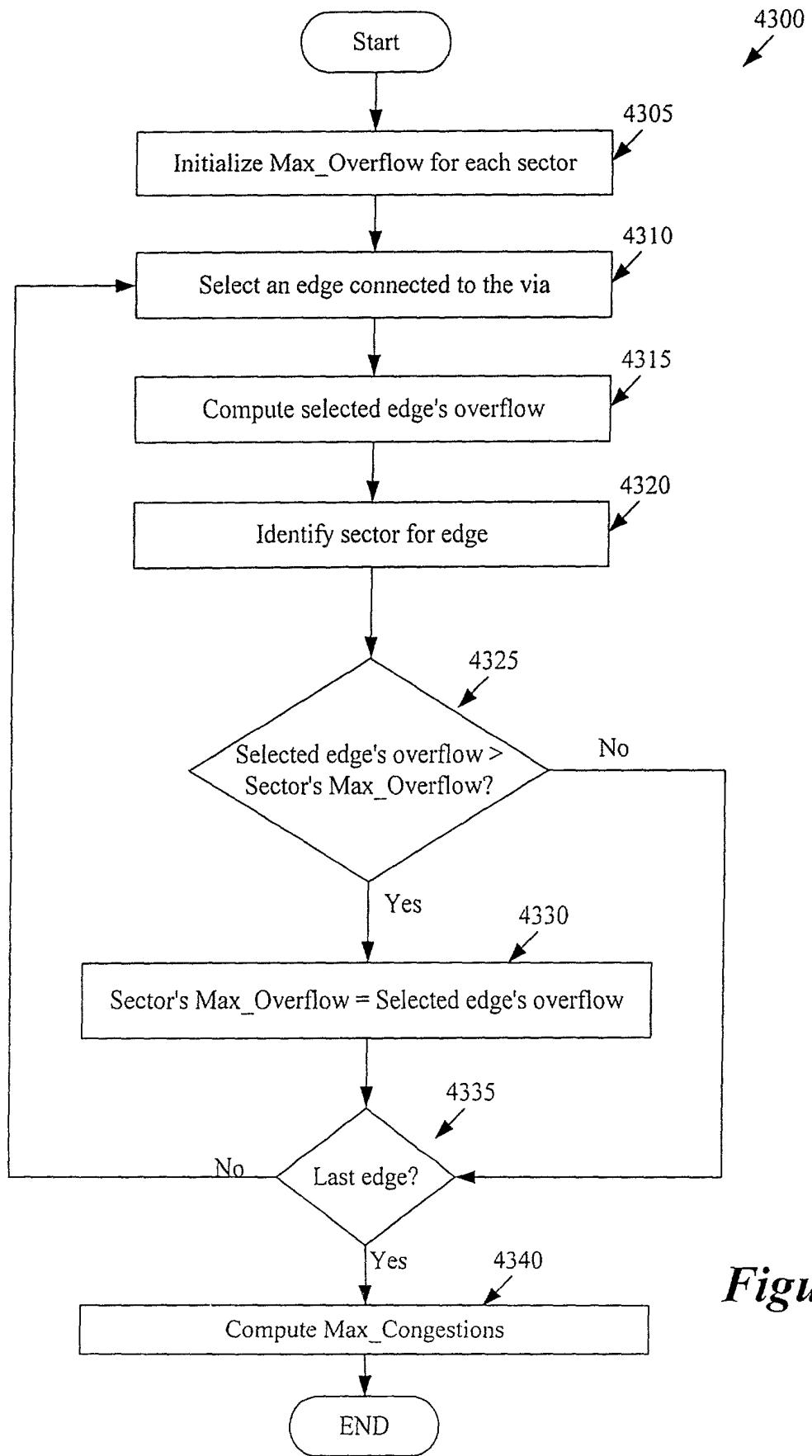
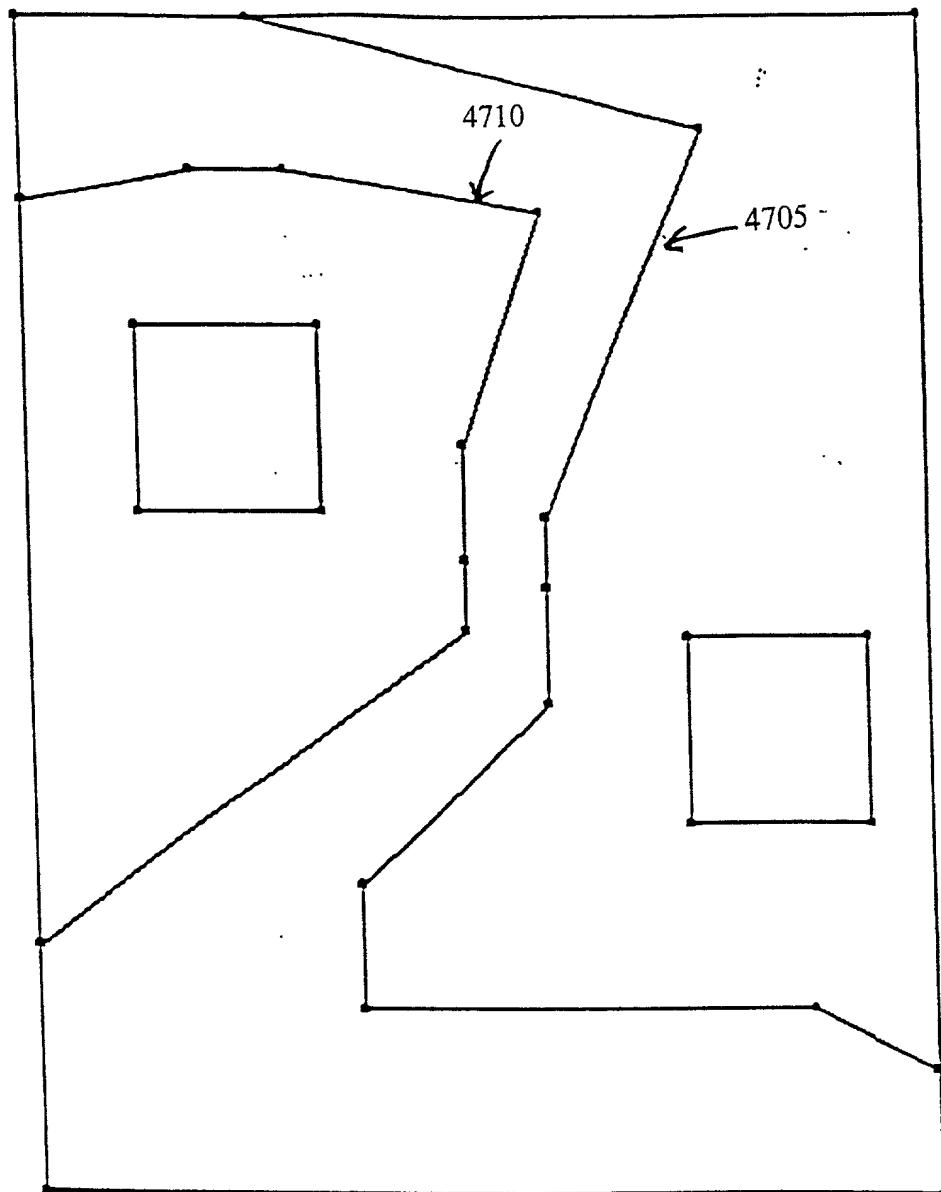
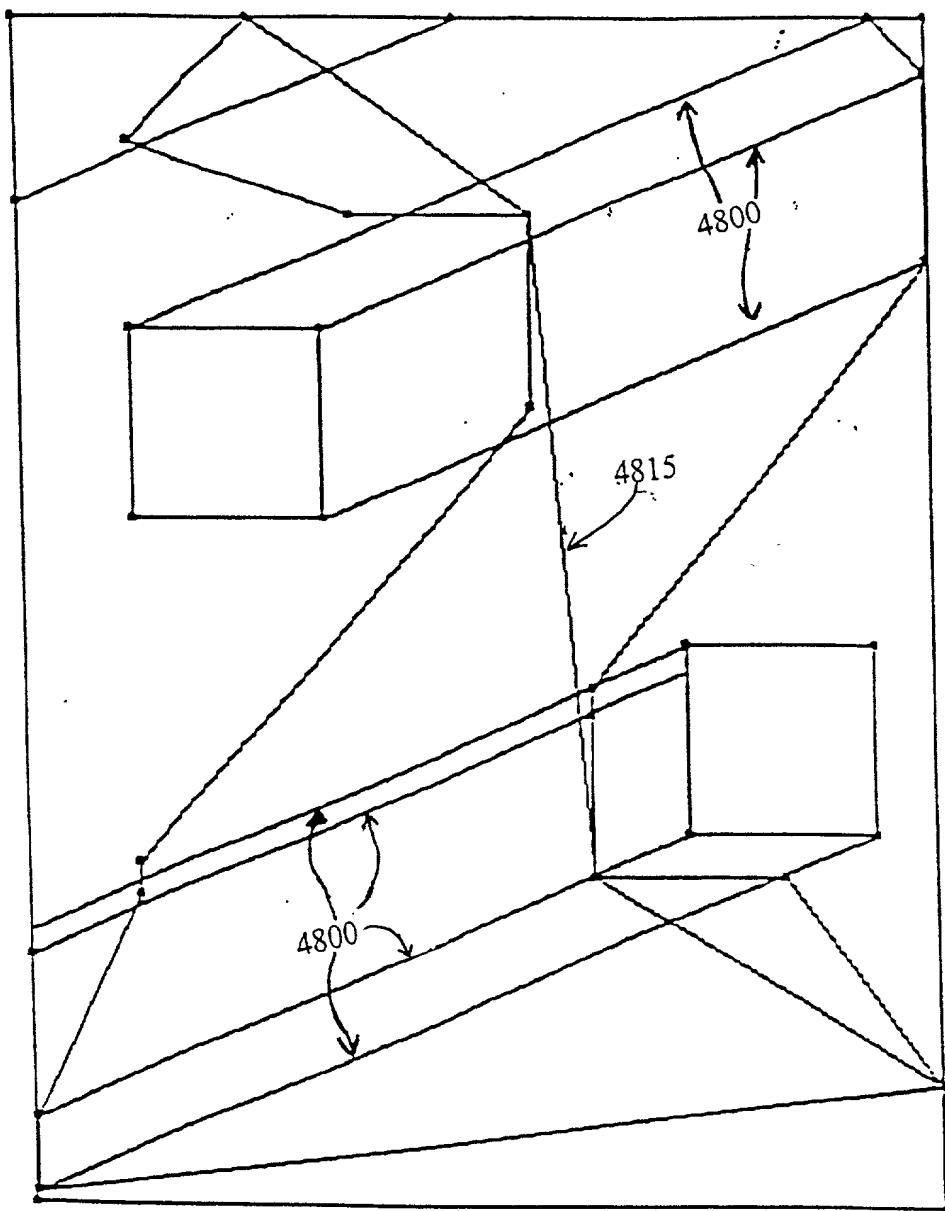


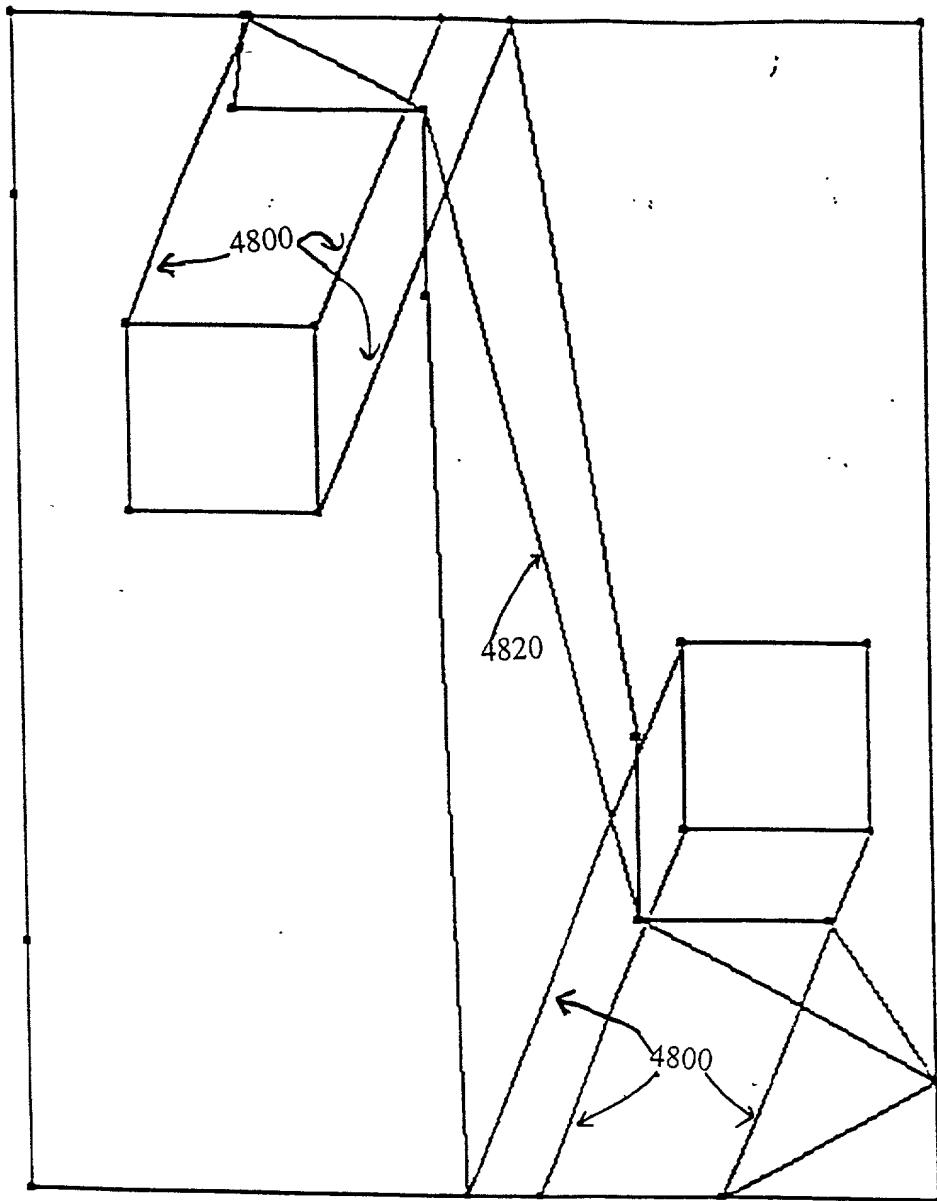
Figure 43



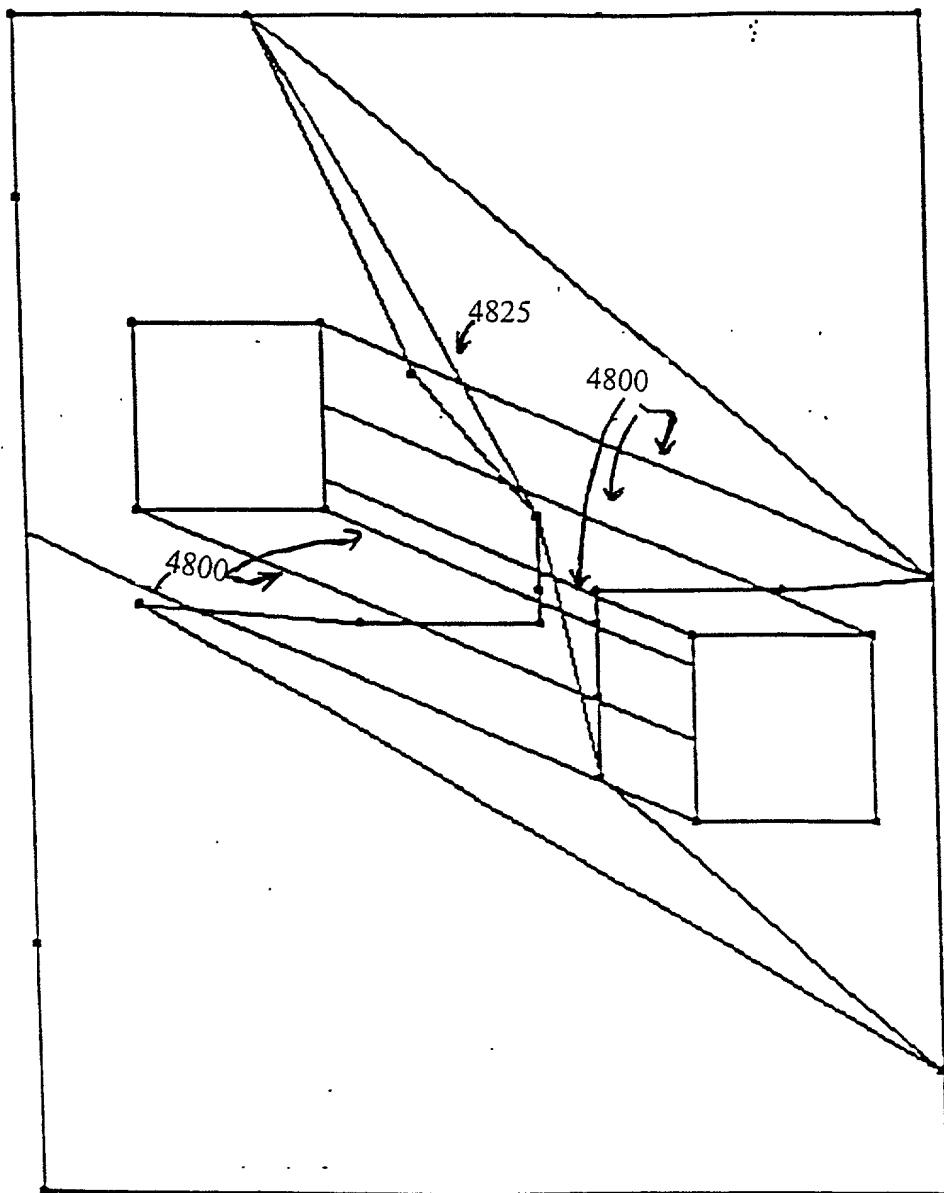
**FIGURE 47**



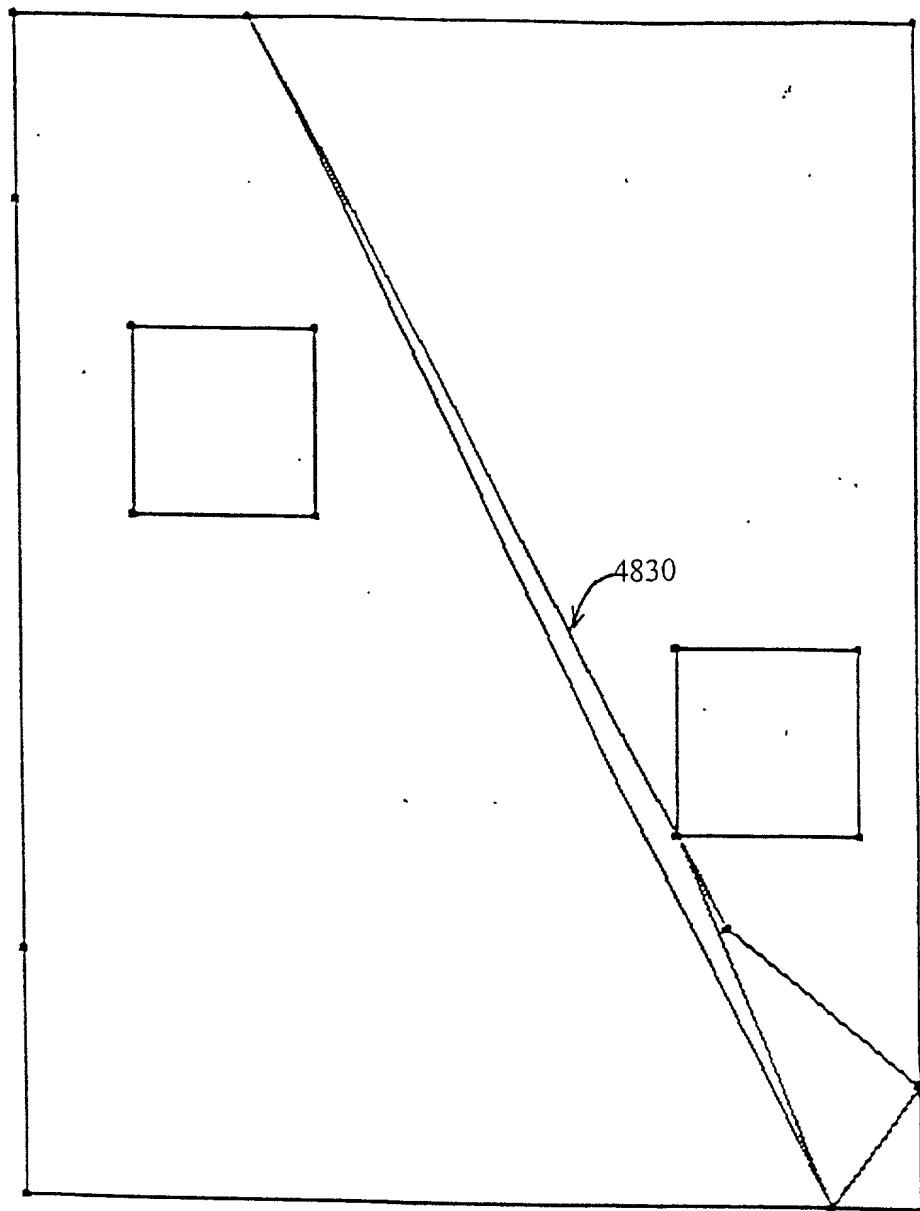
**FIGURE 48A**



**FIGURE 48B**



**FIGURE 48C**



**FIGURE 48D**

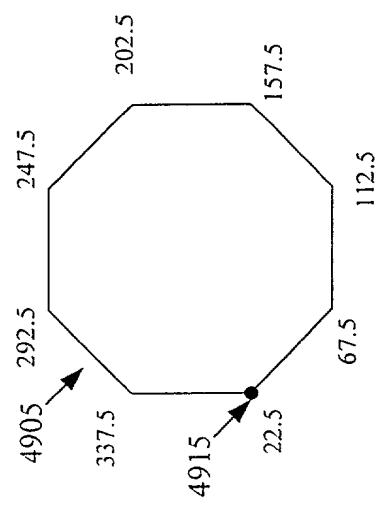


Figure 49A

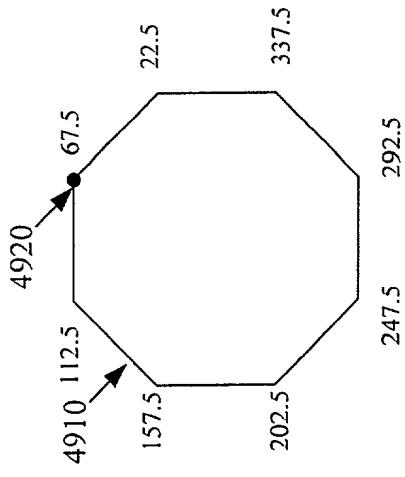


Figure 49B

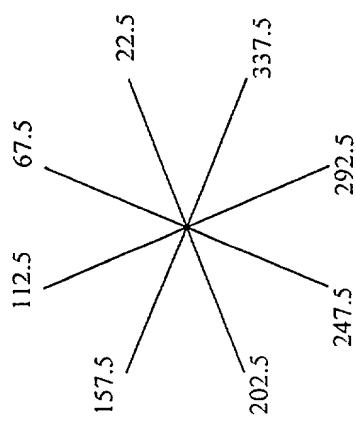
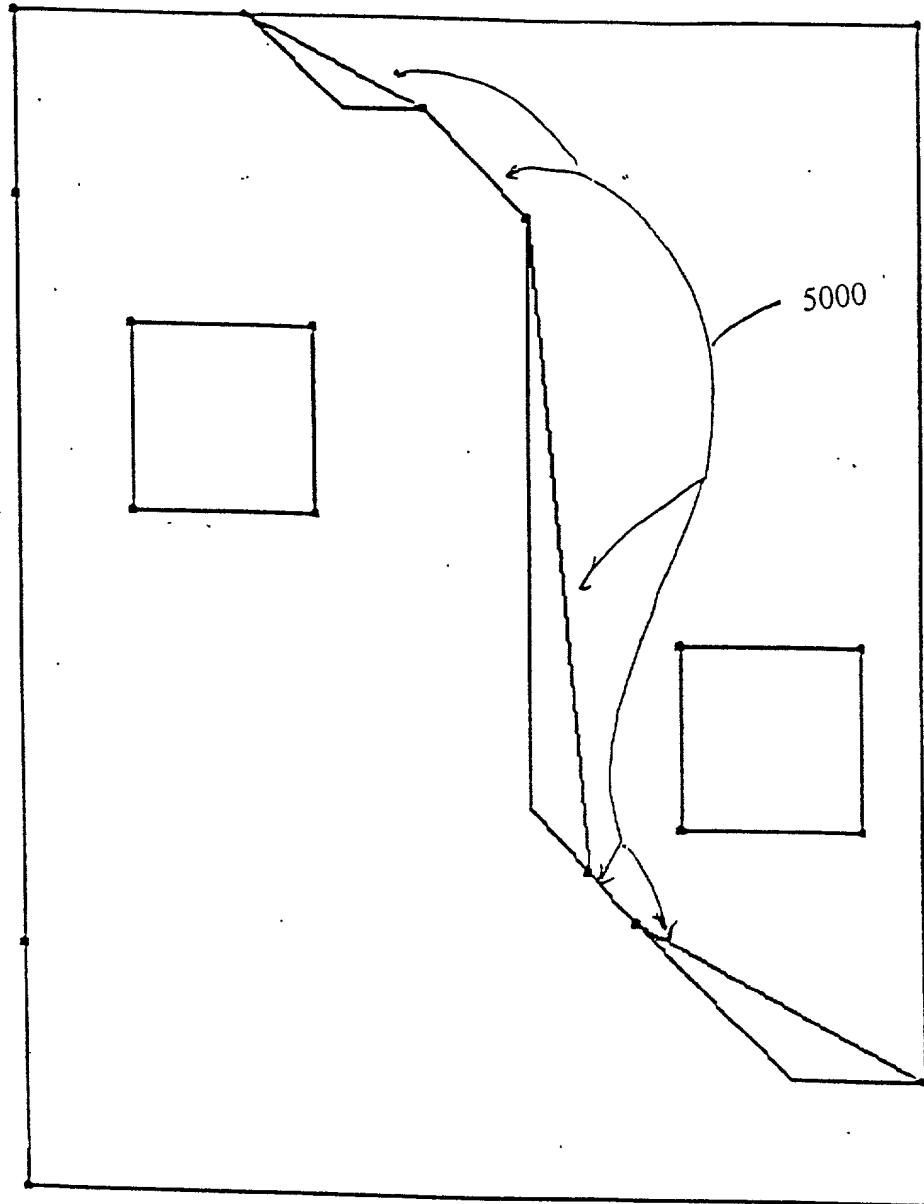
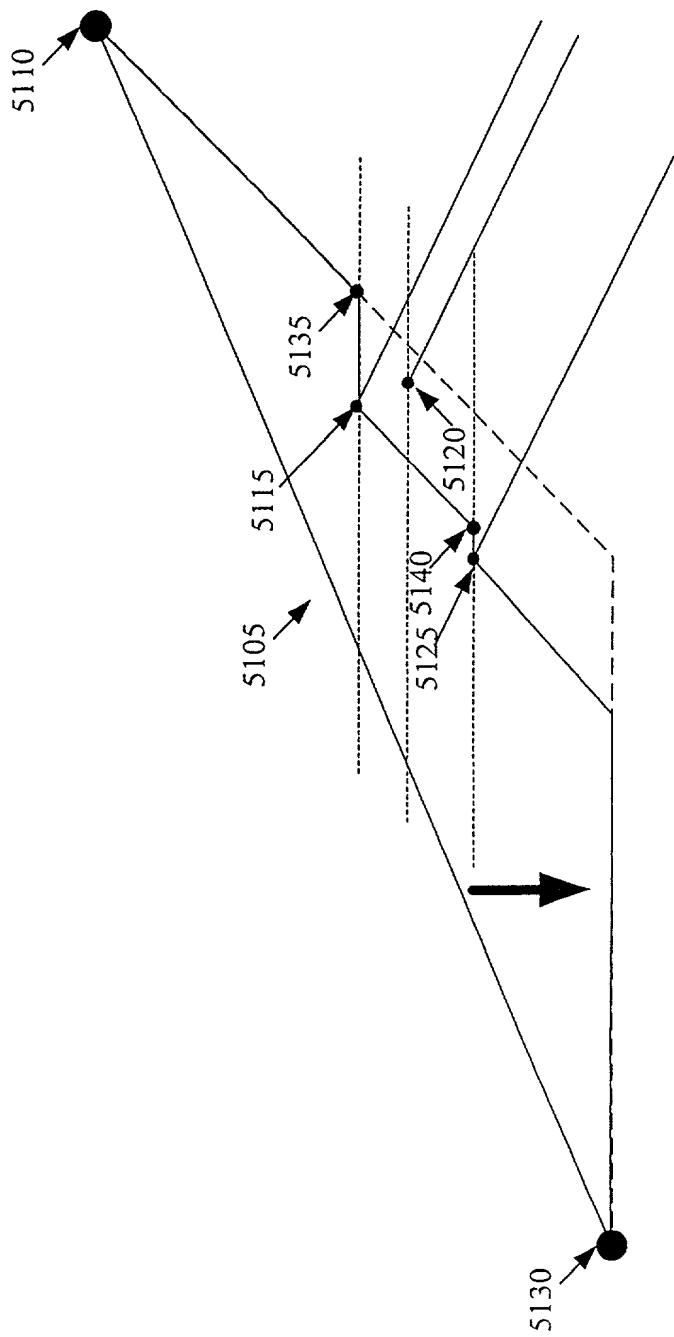


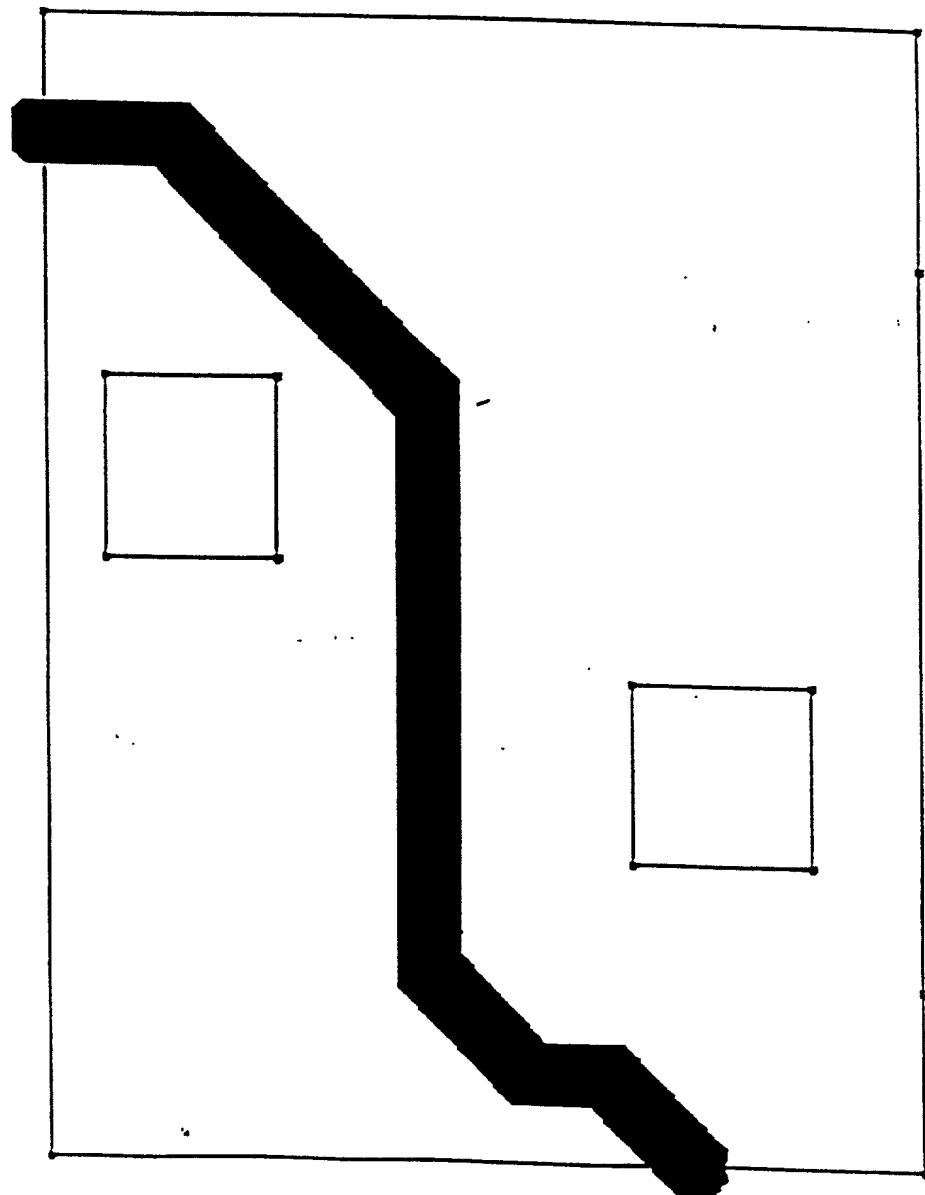
Figure 49C



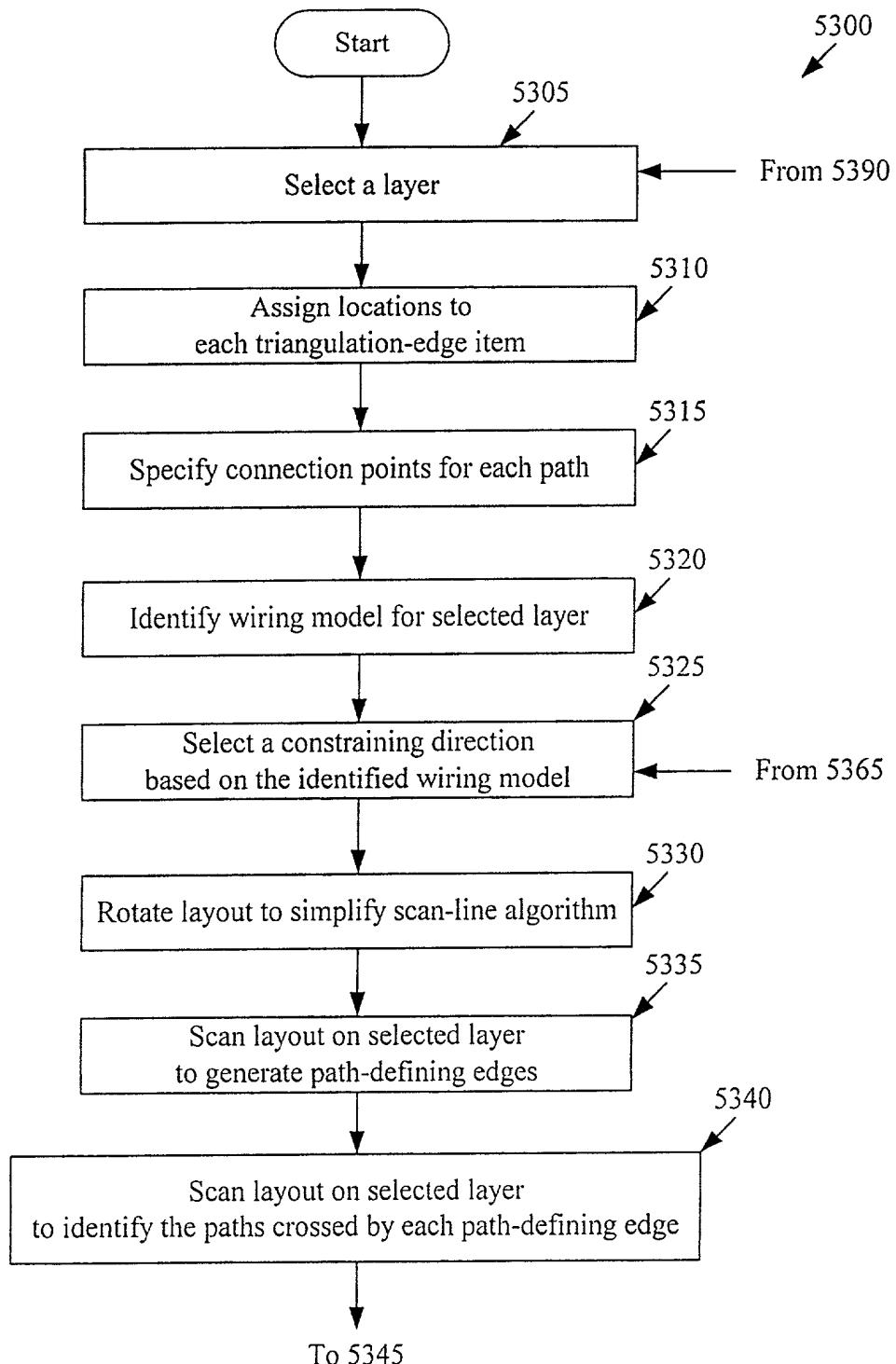
**FIGURE 50**

*Figure 51*



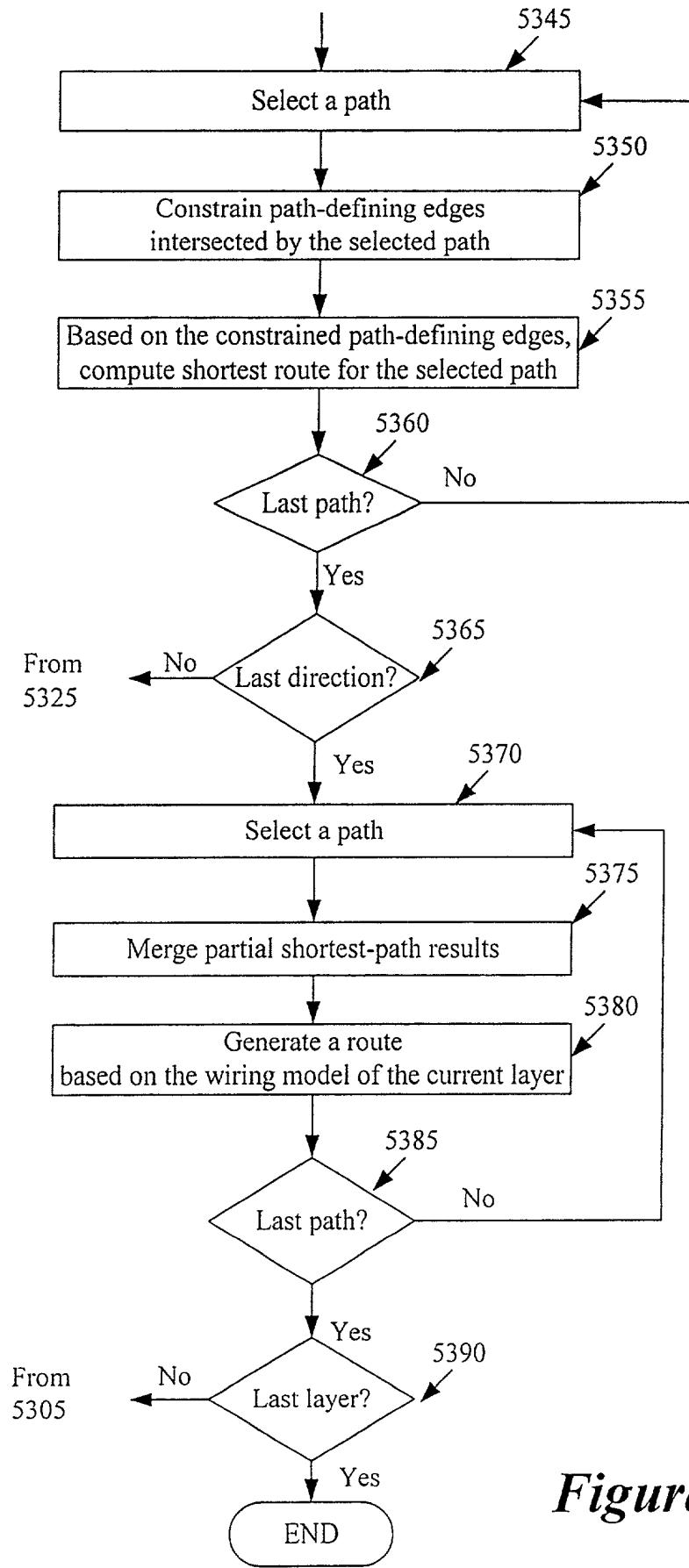


***FIGURE 52***



**Figure 53**

**Figure 53:** *Figure 53A*  
*Figure 53B*



**Figure 53B**

Figure 55

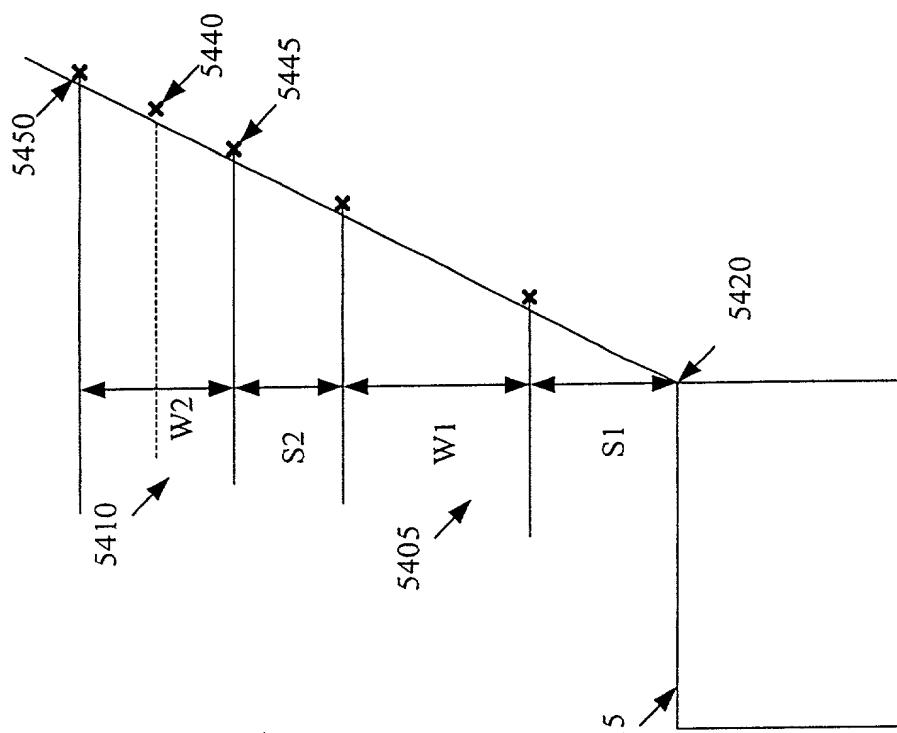
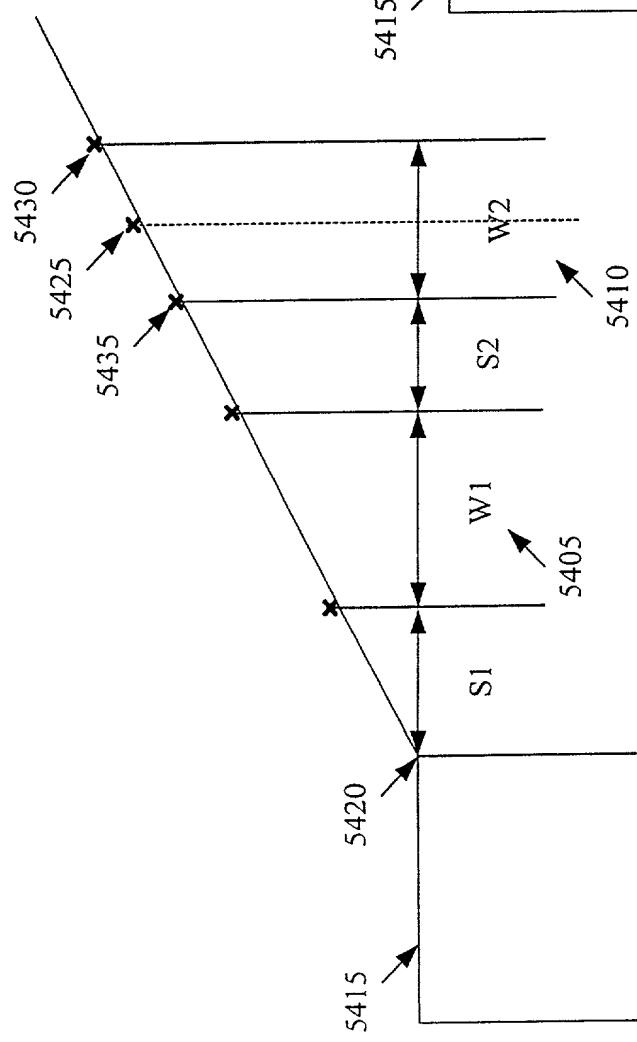


Figure 54



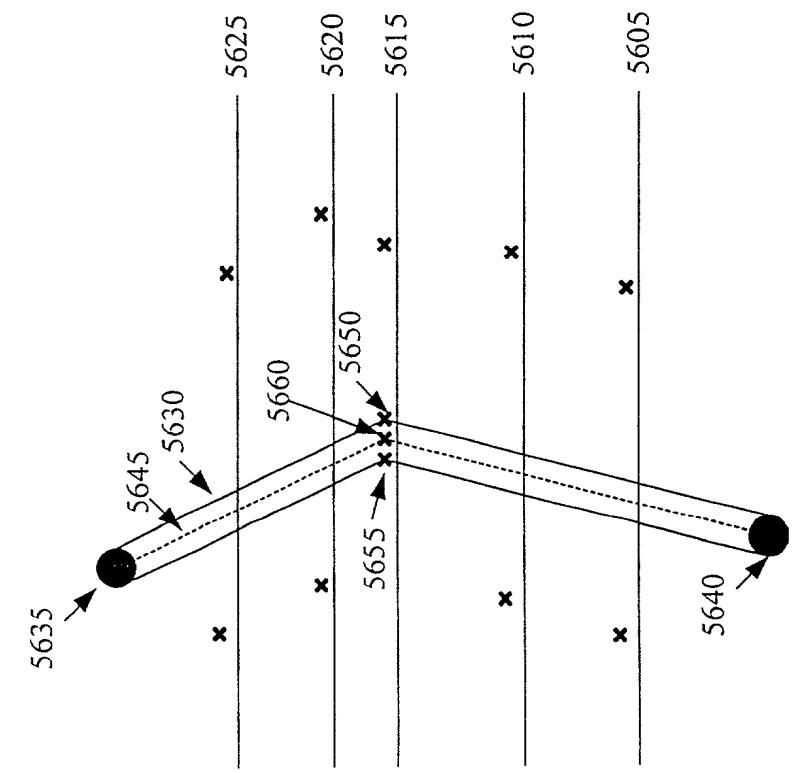


Figure 56

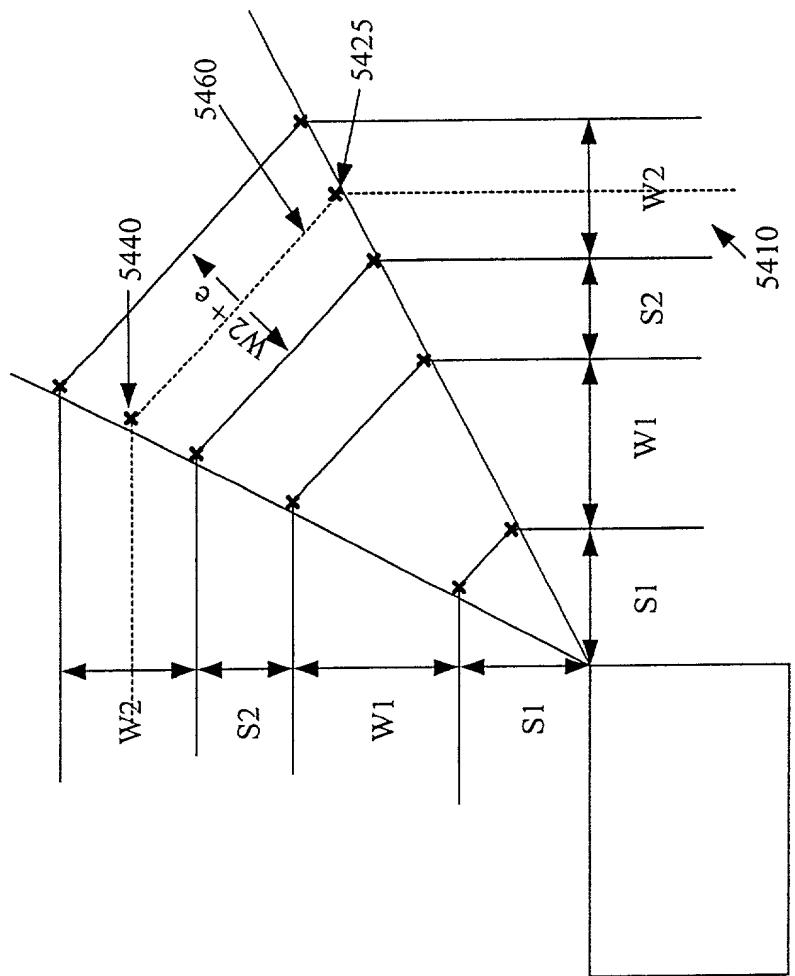
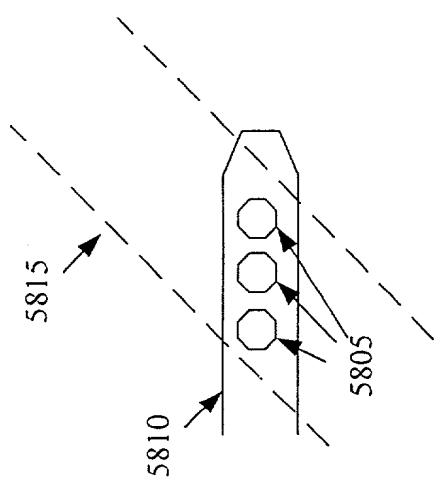
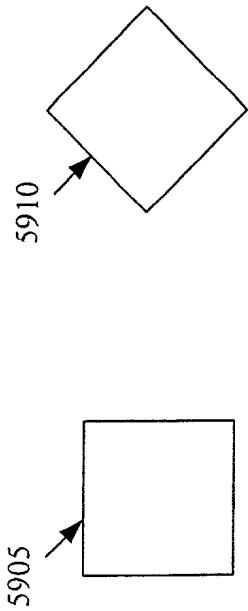


Figure 57

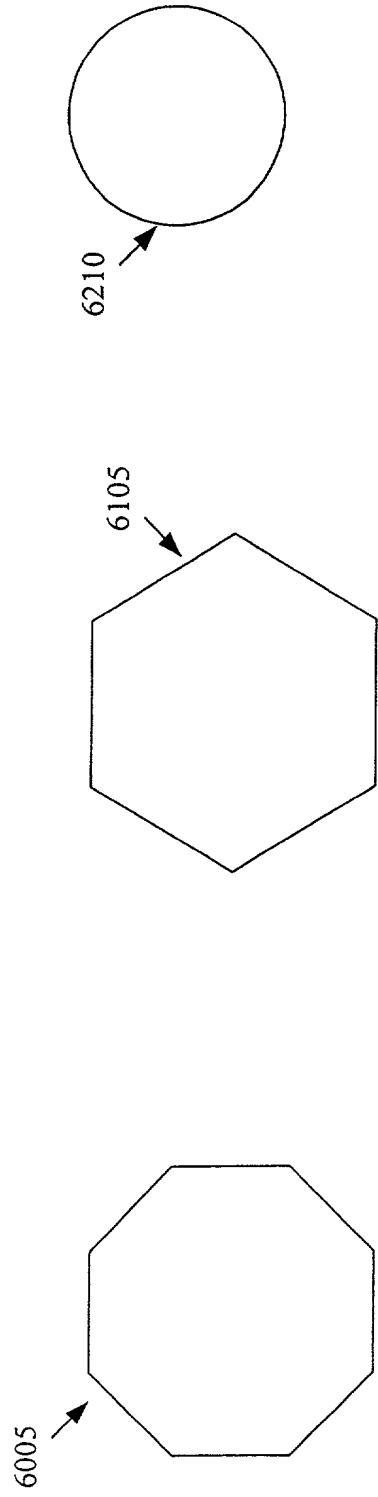
2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100



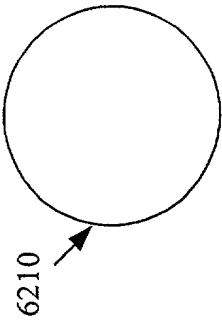
*Figure 58*



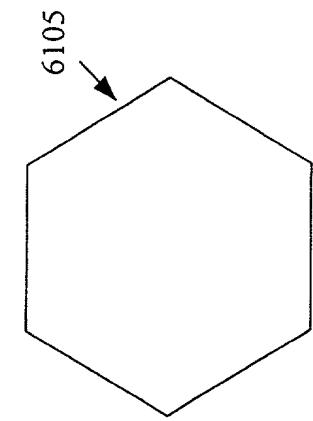
*Figure 59*



*Figure 60*



*Figure 61*



*Figure 62*

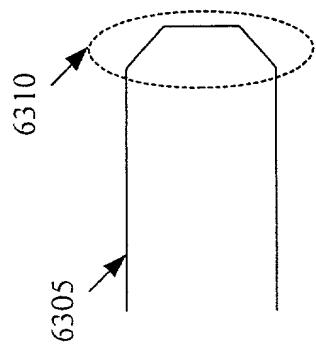


Figure 63

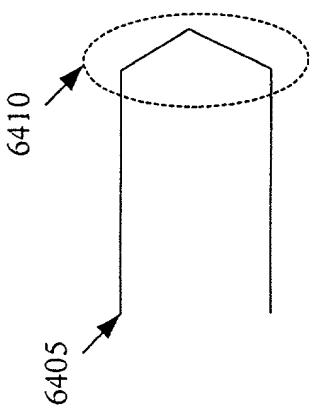


Figure 64

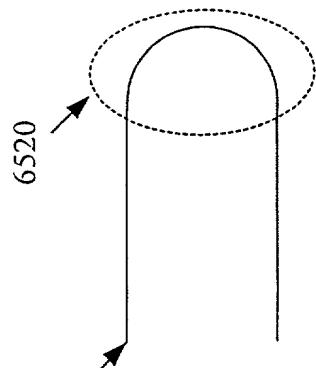
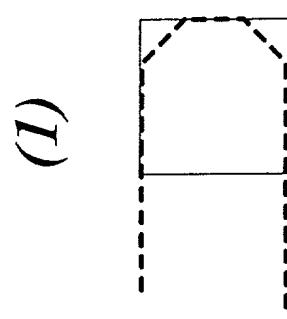
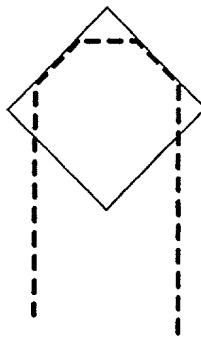


Figure 65



(1)



(2)



(3)

Figure 66



Figure 67

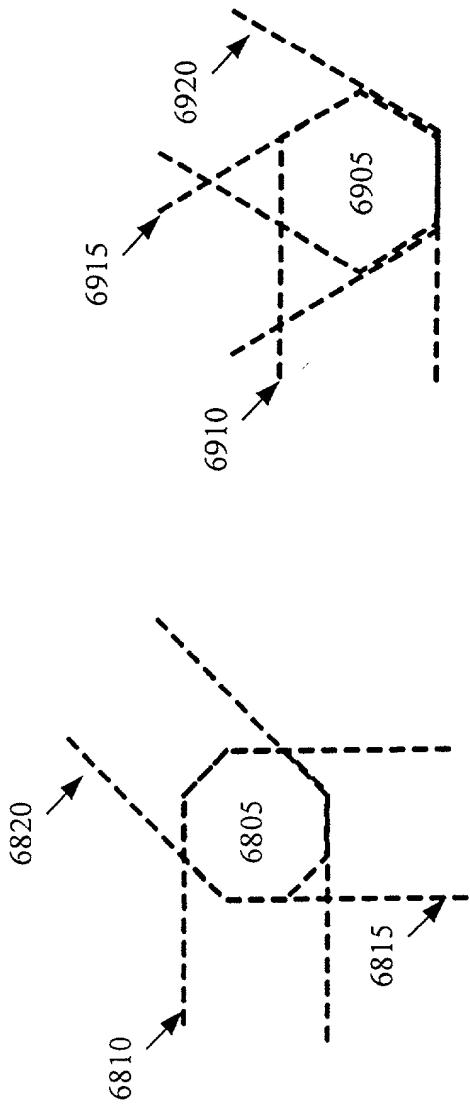
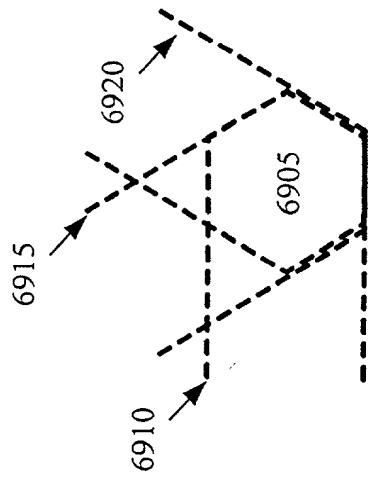


Figure 68

Figure 69



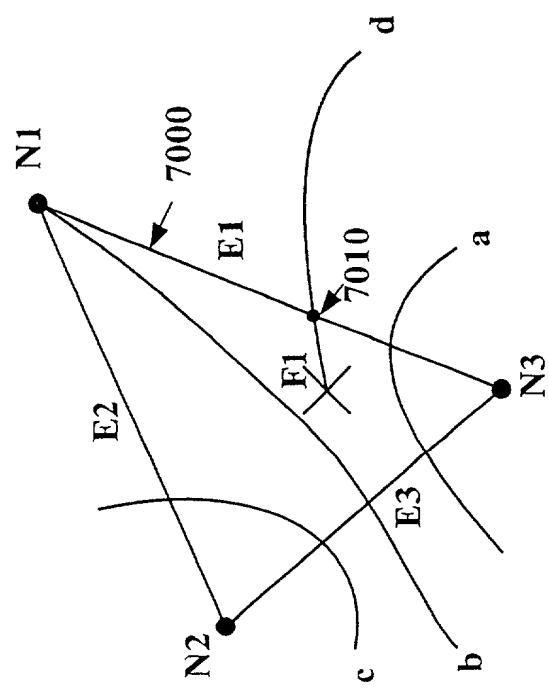


Figure 70

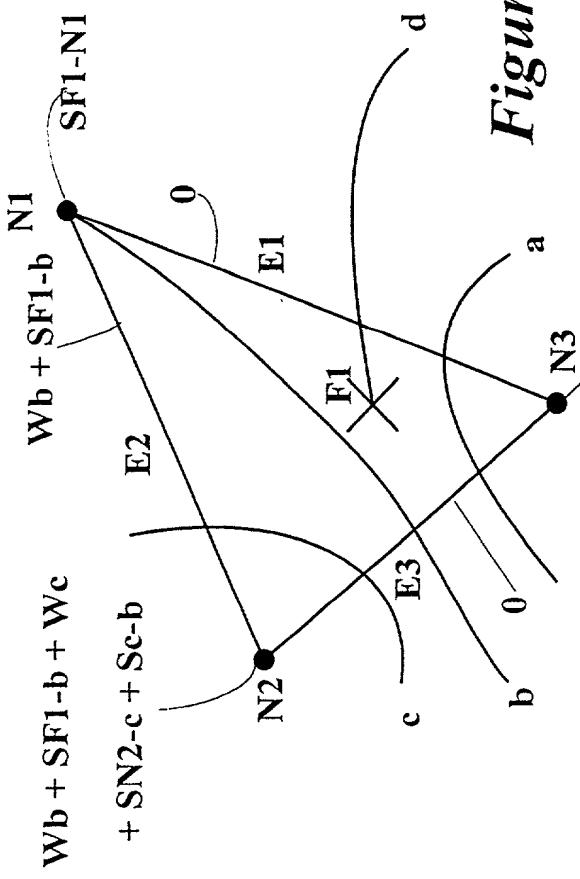


Figure 71

$W_a + SN3-a + SF1-a$

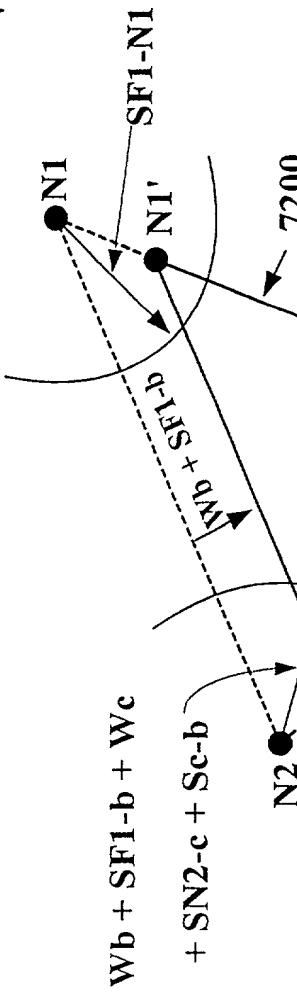


Figure 72

$W_a + SN3-a + SF1-a$

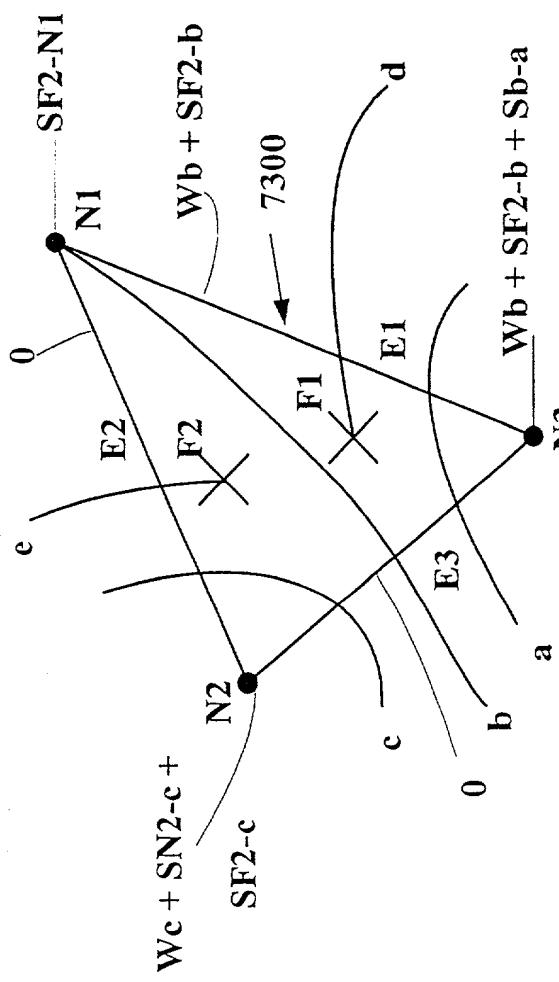
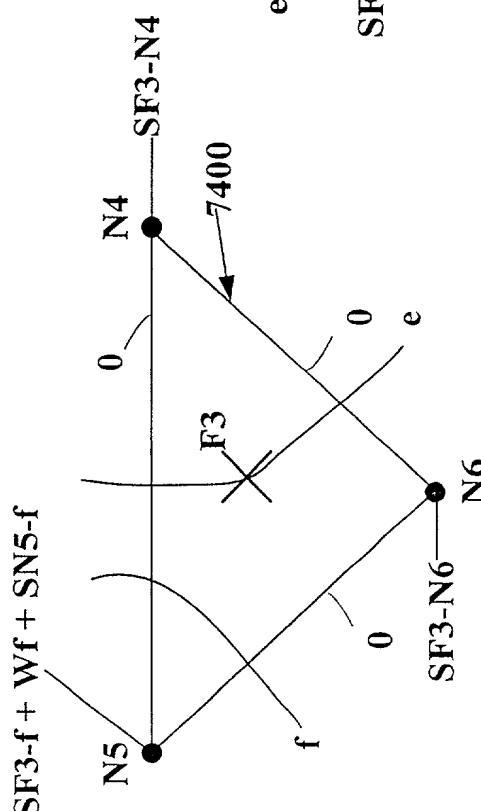
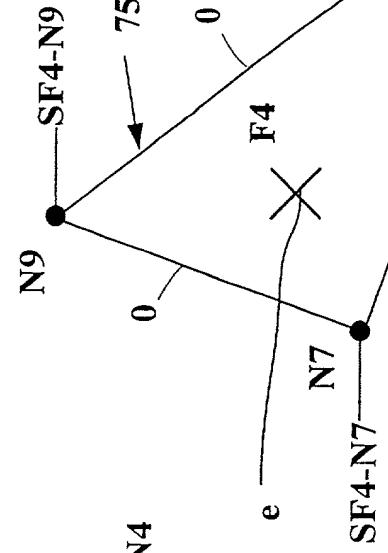
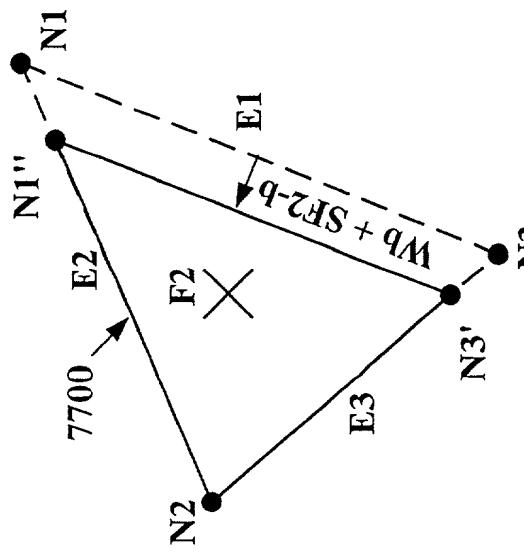


Figure 77



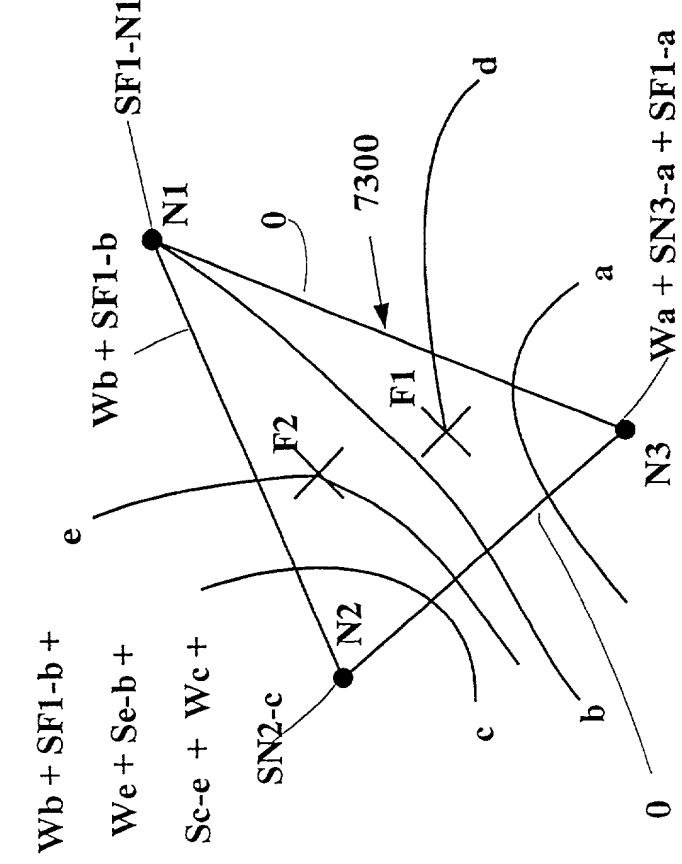


Figure 76

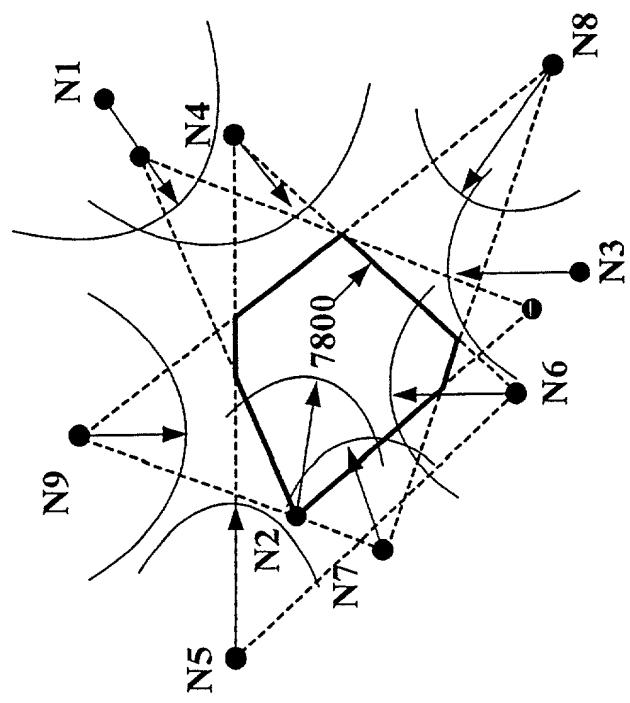


Figure 78

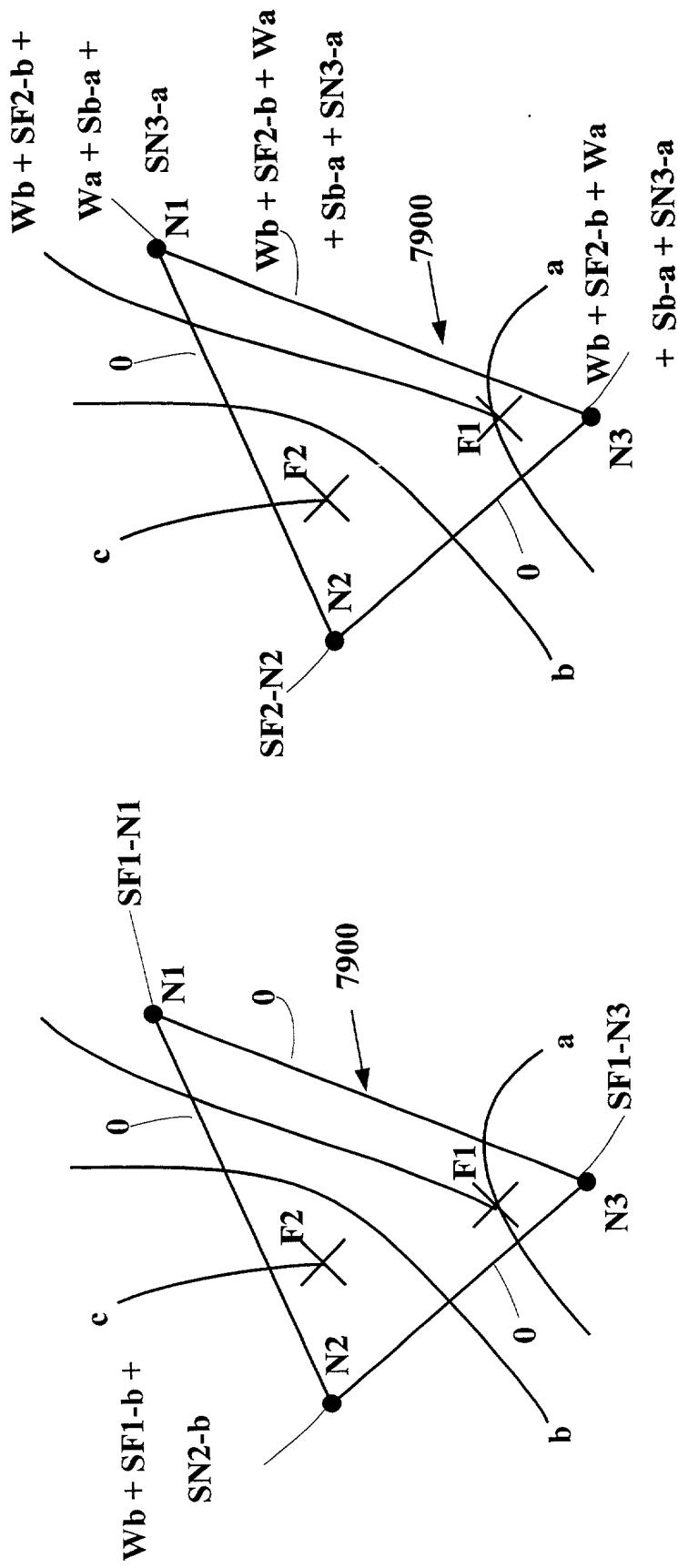


Figure 79

Figure 80

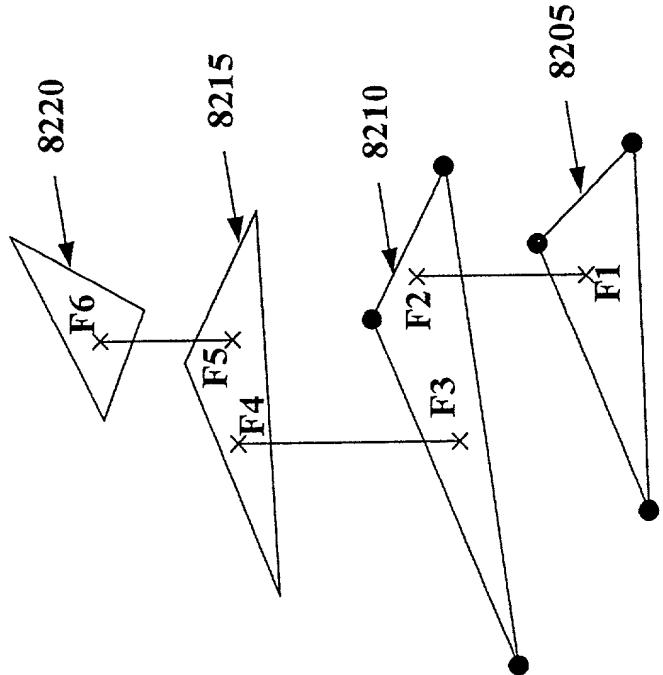


Figure 82

Wc + SN2-c + SF2-c  
Sb-a + Wa +  
SN3-a

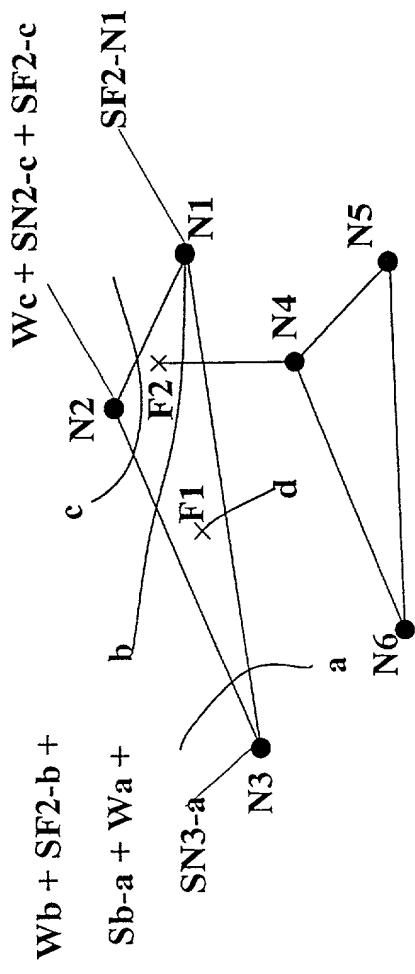


Figure 81

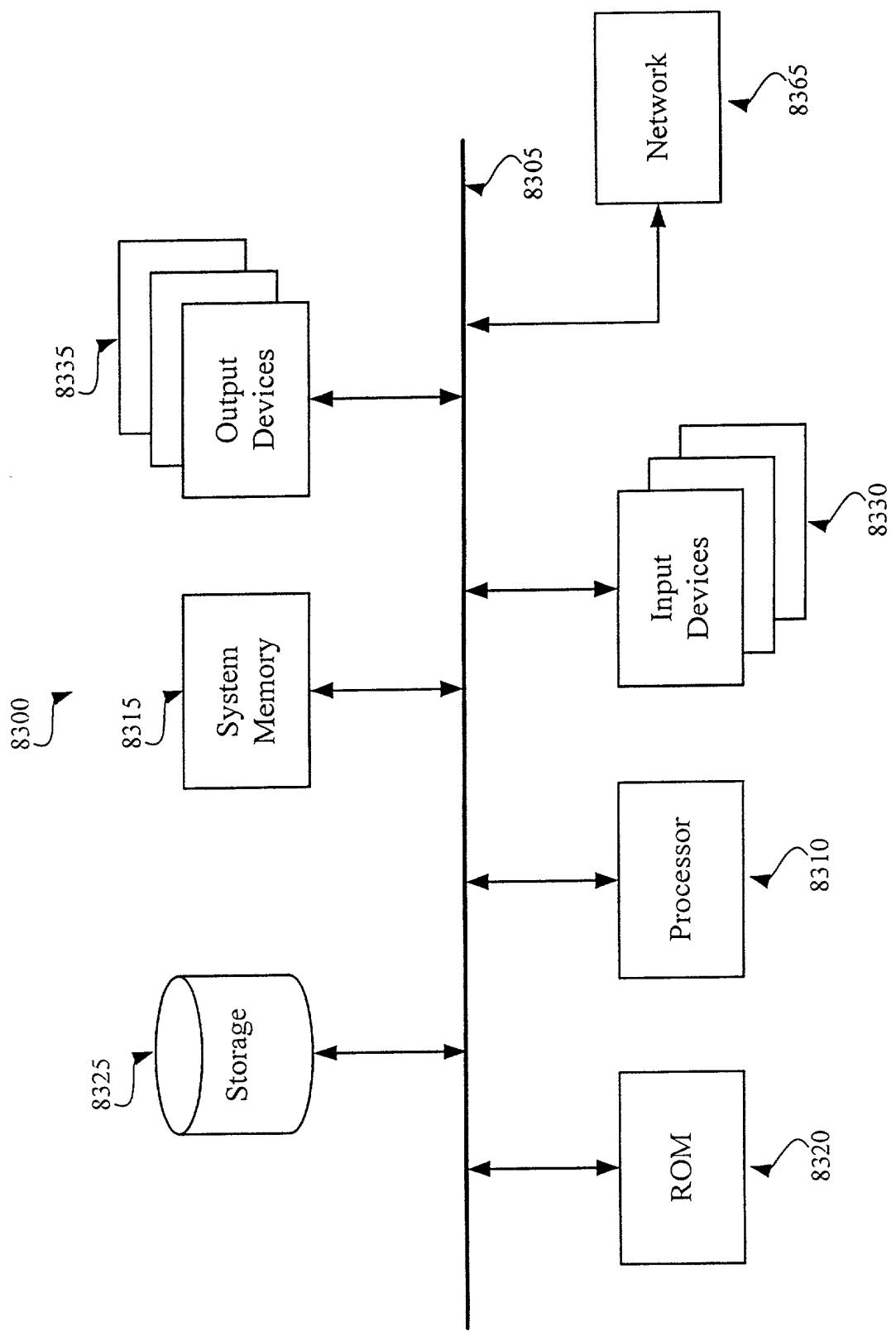


Figure 83